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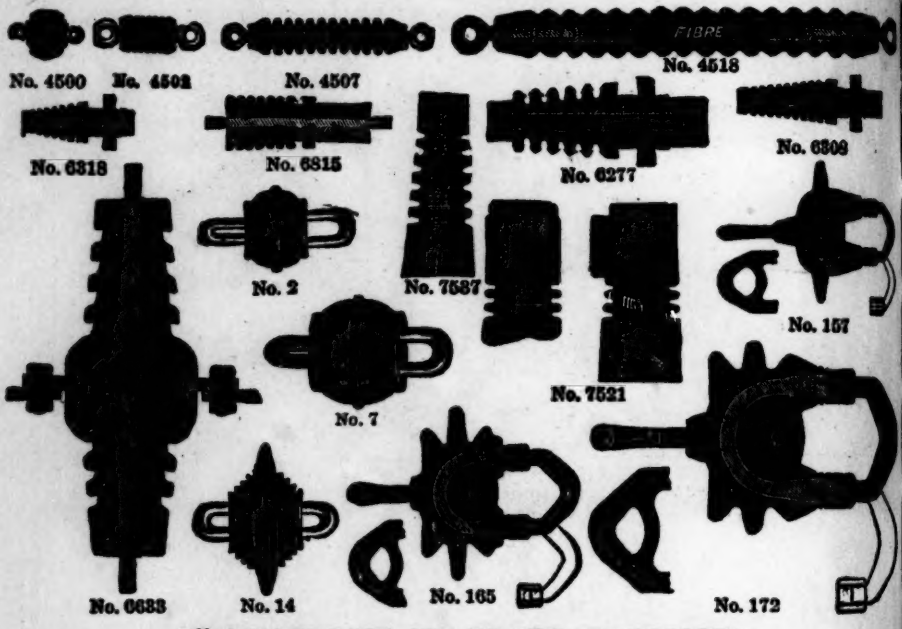

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

RECRUITING SALESMANSHIP

By LIEUT. COMMANDER J. OGDEN HOFFMAN, U. S. Navy

Old-time sailormen talk of the days when the applicants for service in the navy always exceeded the demand and much excitement and competition would be caused by the display of a sign stating that "Two firemen, one seaman and one marine" were wanted. They picture a line forming, like an opera first-night, out of which were picked the two or three men, for whom there were vacancies, much to the disappointment of the other nine hundred.

Those must have been the halcyon days for the recruiting service, if there were any such duty worthy of the name, when all that they had to do was simply to "sit," without the added burden of being forced to think. They remind us of the rough photographs of Civil War times, with seamen old enough to be grandfathers, and be-whiskered gunner's mates leaning, with one foot crossed over the other, on the breech of an old smooth-bore, 12-pounder.

There certainly must have been a lot of romance in those times, and a life of gilded ease for the aforesaid possible recruiting service. Men went down to the sea in ships and stayed on them, never feeling really ill unless they had to cross a crowded street. Fortunately, everything moved along at the same slow, old pace, without taxicabs or electric cars to bring sudden curtailment to the mariner's rolling gait.

In this day of hurry, bustle, and, above all, business competition, the navy recruiting service is a real, live organization. It must

compete against other firms, just as though it were selling sewing machines, electric irons or fireless-cookers. It differs from its parallel in civilian life, only in that its salesmen do not receive a commission on sales, in actual money. At the very outset it must be remembered that it is absolutely different from anything else in the navy, that it must follow commercial methods if it wishes to succeed, and that its personnel, being paid only by the reward of work well-done, must have a very clear idea of all the in's and out's of the naval profession, and must master every detail of their particular branch.

The time has passed when an officer or man could look on recruiting duty as an easy means of spending two years ashore. If he sits back in his chair and waits for the recruits to come in, he will do just about as much business as the young lawyer when he first hangs out his shingle. He must go after them, pursue them, and run them to cover by the force of his personality until he makes them believe that his brand of goods is better than anything else on the market. He must entirely disabuse his mind of the assumption that his two years of recruiting duty are going to make him forget how to work, because he will work harder than he ever has in his life, although it will be of a different brand from that necessary in coaling ship, carrying stores or standing a deck watch. He will enjoy the privilege of learning to know his wife and children, if he possesses them, but the recruiting service has no room for the loafer, and wants only the man who will devote just as many hours a day to it as the emergency requires—it will seldom be less than eight, and often more.

At the start, a recruiting salesman must be convinced, personally, that he is offering a guaranteed, first-class business proposition, or else he might just as well stop right there and try another line of duty. He must believe in his own firm, and what it offers, or he does much more harm than good. In this respect, recruiting for the navy is no different than selling any commercial product, namely, that a salesman is useless unless his heart is in his work, and unless he is thoroughly familiar with the goods he is handling.

For the enlisted man, the recruiting school when in operation, lays the foundation of a recruiting education, the officer must devise his own methods, but neither of them can become good salesmen by what they learn at school. The education and study will familiarize them with many fine points of the trade, and give

them a knowledge of the various laws in the case, but to actually do the selling they must rely on their personalities.

Having briefly outlined the principles that should govern the spirit of the game, we will elaborate on the rules and various plans of action.

Every recruiting station requires, in its personnel, an assortment of natures, temperaments and qualifications. The whole force must work together as a well-organized team, but different sorts of men are needed for inside work, outside work, publicity and so forth. They must all be indoctrinated with the same spirit, but their educational qualifications may vary between wide limits. Taking into consideration the average recruiting district, with one main and five sub-stations, the personnel should be approximately as follows, to thoroughly cover the various fields of activity:

MAIN RECRUITING STATION

FORCE REQUIRED	DUTIES
1 Chief yeoman	Commanding officer's writer. Handles accounts and personal letters. Preferably a stenographer. Handles general reports.
1 Chief yeoman	In charge of outside office. Supervises preparation of records, of recruits for administration of oath, and prepares routine recruiting reports.
1 Chief petty officer	Information desk. Receives applicants, assists with preparation of applications, answers questions regarding eligibility and keeps record book of applicants.
1 Chief petty officer	Record desk. Makes out forms for allotment and War Risk Insurance. Prepares enlistment record, copy of substantiation of citizenship, obtains all necessary signatures of recruit and conducts him to recruiting officer.
1 Yeoman	Office files and transportation.
1 Yeoman	Publicity. (This subject will be later treated at length.)
1 Petty officer	Driver of automobile. Outside publicity agent.
1 Petty officer	Driver of motor-truck. Outside publicity agent.
2 Enlisted men	Outside publicity agents. May be attached to either automobile as a travel party.
1 Chief pharmacist's mate	Assistant to medical officer.
1 Hospital apprentice	Assistant to medical officer.

SUB-STATIONS

1 Chief petty officer	In charge sub-station.
1 Enlisted man	Following-up applicants.
1 Enlisted man	Publicity.

RECAPITULATION FOR DISTRICT

Main station	2	Chief yeoman.
	2	Chief petty officers.
	1	Chief pharmacist's mate.
	2	Yeomen.
	2	Petty officers.
	1	Hospital apprentice.
	2	Enlisted men.
Total	12	12
Sub-stations (5)	5	Chief petty officers.
	10	Enlisted men.
Total	15	15
Total for district		27

The duty to be performed by each of the men above listed is separate and distinct. Although several of the duties may be combined, in case of emergency or sickness, the work of the office invariably suffers, and to have men constantly changed from one duty to another, seriously impairs their efficiency.

The recruiting officer is, ordinarily, a disbursing officer, as well, to the extent of several thousand dollars a month, and his yeoman must, above all, be an accountant, preferably with experience in both the supply and executive divisions afloat. Routine work of the station, making reports, filing correspondence, and the correct accounting and substantiation of all disbursement require a very level head and considerable executive ability. The cash-accounting, purchasing of supplies and handling of appropriations is the same throughout the naval service. Whenever possible, vouchers must be obtained for every expenditure and payment must be made by cheque whenever the amount is greater than several dollars and the supplies may be carried on account. All bills must be "certified correct and just, payment not received," and signed by a member of the firm.

With the service afloat, however, the line officer is relieved of practically all duties involving the custody and disbursal of government funds. This phase of recruiting duty is, therefore, entirely strange to the average sea-going officer and if his yeoman is

not well versed in all of the intricacies of appropriations and allotments, the tour of duty will prove rather expensive for the recruiting officer. The auditor for the Navy Department is, perforce, a very rigid examiner, and accounts must be absolutely correct.

The subject of accounting comes too far outside the scope of this article to be touched upon more than very briefly. It should give food for thought, however, to those entering on recruiting duty, and cause them to devote considerable study to it.

The following is a summary of returns to be rendered, with the appropriations involved and the items coming under each appropriation. Recruiting reports are completely covered by instructions issued to recruiting officers by the Bureau of Navigation or the recruiting inspector of each division, to his division:

	MONTHLY
Account current.....	Copy to Bureau of Navigation for examination and further transmittal to Bureau of Supplies and Accounts. Copy for station files. Copy for personal files of disbursing officer.
Abstract of appropriations chargeable.	Same as above.
Public bills	Same as above.
Status of monthly allotment..	Original to Bureau of Navigation, under separate cover. Copy for station files.
Supplies, with cost, from navy yards.	Same as above.
Statement of check-account..	Card form, to Treasury Department, direct.
	QUARTERLY
Account current.....	Original to Bureau of Navigation, for examination and further transmittal to Bureau of Supplies and Accounts and Auditor for the Navy Department. Copy for station files. Copy for personal files of Disbursing Officer. Copy to Bureau of Supplies and Accounts, direct.
Abstract of appropriations chargeable.	Original to Bureau of Navigation for further transmittal as above. Copies as above.
Public bills	Originals, with substantiating vouchers attached, to Bureau of Navigation, for further transmittal as above. NOTE.—All vouchers in triplicate, one retained for station files and one for Disbursing Officer.

A main recruiting station that is really alive is completely organized as would be any up-to-date business house. It is a very true adage that "What is anybody's business is nobody's business," and in order to avoid this easily established stumbling block, the present scheme covers all of the principal duties. Circumstances will constantly arise, due to sickness, leave of absence, and so forth, where the organization must be consolidated, but every detail should be covered, and each man taught the work of at least two units. The three main divisions are: "Inside office," "outside office" and "publicity." The medical department, with a responsible officer of that corps in charge, takes care of itself.

(a) INSIDE OFFICE

(1) *Accounts.*—A world of study that has been briefly touched by the foregoing notes.

(2) *Transportation.*—The yeoman in charge of this department must familiarize himself with most of the duties of a general passenger agent, and combine with the above the handling of transportation from the point of view of the government. He must learn, by heart, the principal and shortest routes to all points of naval concentration, and keep on hand a library of the latest time-tables. There will be only one or two trains a day, on which it is customary to send recruits or men re-enlisting, and if the yeoman has, before him, a brief of their schedules, a great deal of time will be saved. When the transportation yeoman has completed the transportation voucher and transportation report, he should turn them over to the accounting yeoman who issues the cash necessary for meals en route, transfers of baggage and other necessary incidentals of travel. Requests for checkage of men's accounts for cash furnished with transportation are no longer required, but receipts for all cash must be taken, with a statement of the reason for each issue. In this connection, it may be mentioned that examples are constantly presented of men who have been furnished inadequate funds for cash payments. Such occurrences cause hardship on the men concerned and reflect discredit on the naval service. The various allowances are plainly tabulated and if too much money has been advanced, the man must refund it in accordance with instructions on his transportation report, so the government will not lose, in any case. The shortest practicable route must be employed and the officer issuing transportation is respon-

sible for its selection. It therefore pays to carefully study the connections between the recruiting station and various receiving ships, etc., as there are several wrong routes for every right one. If the yeoman is forced to run his finger the length of a dozen time-tables, and the recruiting business happens to be booming, the outer office will be filled with a crowd of impatient and often disgusted recruits. Such a state of affairs not only gives men a false impression at the outset of their naval service, but might easily cause applicants to seek some other employment, where such inefficiency did not prevail.

(3) *Files.*—There is nothing more satisfactory than a good filing system, and nothing more maddening than to have to spend valuable time in search for a letter, of which everyone remembers the existence but no one can find. To design a filing system is beyond the scope of this article, and a large-sized volume might be devoted to the subject, but a few cardinal truths may be mentioned to advantage. The secret of any good filing system is simplicity coupled with order. As regards disbursing returns, "safety first" should be the motto, and every disbursing officer should jealously guard a personal copy of his returns, from the day that he takes charge until he relinquishes it. No matter how many auditors serve in that capacity for the Navy Department, any one of them can open an account that has been closed by a previous incumbent, and there is no such thing as a dead account, as far as the responsible officer is concerned. The proof, for or against, is all in his hands, and he should preserve it with his most precious documents. In regard to the filing of letters, reports and so forth, it may be mentioned that no two minds will work in exactly the same channels, but that several minds may be indoctrinated with the same ideas. Six people may file letters under as many subjects, if they are not taught to grasp the predominating note in any text. The actual system employed matters but little, as long as the man in charge understands it thoroughly and assumes the point of view of the designer. The outcome must be a clean desk at the end of every day. *To-morrow never comes.*

(b) OUTSIDE OFFICE

The men who receive the applicants for enlistment and subsequently prepare them and their records for enlistment and transfer,

must develop sufficient clerical ability to fill out, correctly, the various forms, telegrams and routine reports.

For the above reason, the man in charge has been designated as a chief yeoman, although it is not absolutely necessary. Clerical exactness, however, matters considerably in the contentment of the office force, and may draw a man of previous naval service to one particular recruiting station, rather than to another, if he knows that at the former he will be re-enlisted with despatch.

All of the outside force, however, must, above all, be diplomatists and have agreeable personalities. A lad joining the navy is naturally diffident, and the manner of his reception often makes the difference between gaining or losing a recruit.

If the applicant is rejected and curtly dismissed, either with scorn or without consideration for his disappointment, the navy has made a decided enemy. Every applicant can be made a friend of the navy, whether or not he succeeds in passing the examination for enlistment, and, furthermore, he can be made an active recruiting agent, and a most effective one. One system that works very well, is to have every applicant write on a suitably ruled card, the names and addresses of some of friends, whom he believes are over 18 years of age and suitable material for the navy. If he is informed that these names entail no obligation upon himself, and that a number of fictitious names and addresses will only give an added burden to the recruiting service, it will be found that he enters into the spirit of the game, and opens sources of information that would, otherwise, have been closed. The use of these cards will be further explained in detail.

If the applicant fails to pass, due to some physical defect, he will be downcast and in need of sympathy. A cheerful word, even if it does not cause him to correct the defect, which is sometimes possible, will invariably produce results. He will tell his friends of the treatment he has received, be it good or bad, and the navy will be agreeably implanted in their minds. Many young men would apply for enlistment if they were not afraid that from the moment they enter the recruiting station, purely to seek information, they became, in some way, obligated to "go through" with it. Every applicant who is courteously received, helps to dispel this fallacy.

The organization of the outside office, normally consists of the following three headings. When recruiting is rapid, three men are

required, but the duties can be concentrated in case of emergency or slack business.

(a) *Information.*—Answers the multitude of questions that make up the day's work, directs the writing of applications and determines the branch of the service for which the applicant is best fitted. Varifies the substantiation of citizenship of the applicant, and sends him to the medical officer with application correctly made, with birth certificate attached. The man performing this duty should be thoroughly familiar with naturalization laws and capable of detecting alterations or deficiencies in substantiating papers.

The above duty requires the highest type of sales ability, and it is the most important post in the recruiting district.

(b) *Records.*—Takes the accepted applicant, from the time he leaves the hands of the medical officer, and executes all forms pertaining to enlistment, with the exception of medical record. These include: Service record, applications for allotment and insurance and shipping articles. Files office copies of records, application and substantiation of citizenship, and conducts applicant to recruiting officer for administration of the oath of allegiance. The above man should also obtain sufficient notes of the career, education, etc., of the applicant, to furnish the basis for a newspaper article, and obtain from him the names of some of his friends, for the use previously stated. This post requires clerical ability and a thorough knowledge of existing rates of pay and additions.

(c) *In Charge.*—Preferably a chief yeoman, although either (a) or (b) should be capable of performing his duties in case of emergency. Has general charge of the outside office, and prepares necessary reports and returns as follows:

Daily: Report of enlistments (N. Nav. No. 4). Quadruplicate. Bureau of Navigation; two copies to recruiting inspector; copy for file.

Daily or when occurring: Reports of transfers and receipt of men. (Form N. Nav. No. 8) Duplicate. Bureau of Navigation, and file.

Weekly: Report of enlistments by ratings (telegraphic), Bureau of Navigation and recruiting inspector. Written report, letter form containing same information in further detail, Bureau of Navigation and in duplicate to recruiting inspector.

Weekly: Report of applicants, failed to report and enlisted. Duplicate to recruiting inspector; copy for file.

Weekly: Insurance. Quadruplicate. Bureau of Navigation; duplicate to recruiting inspector; file.

Semi-monthly: Reasons for enlisting. Duplicate for recruiting inspector; file. (15th and 30th.)

Semi-monthly: (N. Nav. No. 25) Report of vacancies. Quadruplicate. Bureau of Navigation; duplicate to recruiting inspector; file.

Every 4th week: Report of enlismtents, letter form. Age and service of recruits. Bureau of Navigation; duplicate to recruiting inspector.

Man in charge checks entries regarding pay, etc., in service record, collects records for signature of recruiting officer and sends reports and records to their destinations.

Men enlisting for trades must be examined by the recruiting officer, and their qualifications should be determined shortly after they enter the office, so that there will not be the slightest delay in executing the successive steps.

If the outside office is properly organized, it should be as easy to enlist fifty men, or a hundred, as it is to enlist five. With three separate desks, and lines of demarkation between the duties of the personnel, there should be a steady flow of men from one desk to the other. Aside from the time that is expended in helping an applicant to decide his fate, the complete process of enlistment, from the time a man enters the office until he leaves it, should be considerably less than one hour. Nothing counts as much with an ex-service man as the rapidity with which he may be enlisted and, aside from reasons of expediency, there is no better business asset for a recruiting station than speed and accuracy in the outside office.

(c) PUBLICITY

To spread the advantages of the navy before the public is the most important objective of the recruiting service, and all members of the personnel should co-operate to this end. The various standard methods may be summarized as follows:

(1) Posters.
(2) Moving picture reels and slides.
(3) Personal advertisement and solicitation.
(4) News articles.
(5) Mailing lists.
(6) Speech-making.
(7) Miscellaneous.

(1) *Posters.*—The Navy Recruiting Bureau has a large establishment that furnishes, periodically, advertising matter to the various recruiting stations. It is impossible for them to keep pace with the unlimited demands of the whole service, and it therefore

devolves upon individual stations to exercise their own ingenuity and create advertisement of local value. It is always possible to spend a small amount of money from the station allotment, and special allotments can be obtained in nearly all cases where the occasions demand them.

The business of "sticking-up" posters is really the source of much amusement and the personnel, once initiated into the game, are usually more than willing to spend all their time at it. There is always the possibility of being arrested, while in the attempt of spreading this form of publicity, which adds a little sporting zest to the pursuit. Nearly all business concerns will, however, lend their assistance and co-operation if properly approached. This is particularly true where the navy poster is an attractive pictorial, which in nowise detracts from any other advertising matter that may be on the spot. The business of wrapping a poster around a telegraph pole is a trifle risky, but, sometimes, the location is so strategically perfect that the impulse simply refuses to be denied.

It is an advertising scheme, first and foremost, and, in this connection, advantage should be derived from all local catch-words and phrases. The wording of a poster being, primarily, intended to arrest the attention of the passerby, must not be too detailed, and salient facts must be stated briefly, concisely and in unusually forceful language. Unnecessary verbiage is simply confusing to the reader of the poster, and it is much better to err on the side of having too few words, gaining in "point" what we lose in "volume." Many advertisers fail to realize that the location of the main point of their message varies considerably in value, depending on its location relative to the body of the sheet. An advertisement in the upper right-hand corner of a news sheet or paper, for example, is worth more than twice an advertisement in the lower left-hand corner, and an advertisement in the middle of the sheet carries more weight than one at the top or bottom. This is not a matter of mere guesswork. The relative values of every part of the sheet have been established by psychological tests, as any standard text-book on the science of advertising can demonstrate.

There are three cardinal facts to be borne in mind with regard to bill-posting. These are: (a) The text; (b) the location; (c) the number of posters placed in any one location.

(a) *The Text.*—In framing a poster, the heart of the reading matter, the gist of the message, must be given the most valuable

place on the sheet, and must be in the largest type. If the subject occupies more than one line, it must be divided at the top, middle and bottom. In addition to relative location, "contrast" enters into the game, and the type above and below the principal features should be small and, if possible, of a different color. A poster that is to be placed on a street car or other moving body requires the maximum information in the minimum space, and if the poster contains matter that cannot be read at a glance, it will be lost to all but a very small percentage of the readers. The size of poster used on street cars, an excellent advertising medium when they can be obtained, is 21" x 22", or quarter-sheet. A poster of this size is easy to paste in any location and it is, therefore, a useful size for general posting as well as on the moving car. If it is to be used for both purposes, small text should be used in conjunction with the large type, but one must not interfere with the other. The average man passing this poster on a fence, for instance, will read only the large type. If he is interested, however, and if the large type is sufficiently forceful to excite his curiosity, he will stop and read the poster from top to bottom. This will also apply to the man who is waiting for a car, and reads the poster on other cars, as they come to his corner and take on and discharge passengers.

With posters, the principal feature of which is a colored picture, little text should be included, and the converse is true of text posters. These two types attain their maximum value when associated together, a colored picture, with informative type on either side. The passerby is attracted by the picture, and while he is looking at it he becomes interested in the posters surrounding it.

(b) *The Location.*—Before posting virgin territory, a careful survey should be made of the terrain and notes made of the locations that draw the greatest number of people. These are naturally the points where a poster would be of the greatest strategic value, and the principal displays, bill-boards, exhibits, and so forth, should be so placed. The posting in any one city should be so distributed that the entire territory is covered, and the only way in which this may be accomplished is to divide the territory into zones, the principal thoroughfares being the boundary lines. The small, cross streets are of little moment, as, if the zone is practically surrounded by a chain of posters, everyone in that zone will have the navy placed before them unless they are bedridden invalids. The usual tendency is to have a thick display of posters in the business center

of the city, and in the vicinity of the recruiting station, and to forget the outlying sections. Displays should gradually concentrate as they approach the recruiting station, but the city should be posted to its extreme limits, and the highways leading to the next city, intermittently posted.

Where the location of posters may be considered as permanent, a "poster station" should be established, recorded, and receive a systematic inspection to see that the display is in good condition. To facilitate inspections, the poster stations should be numbered chronologically as they are established, and further recorded by zones.

(c) *The Number of Posters in Any One Location.*—There is much difference of opinion regarding the number of posters, in any one place, that attains the maximum advertising with the minimum waste. From psychological experiment it has been demonstrated that four posters placed together are of much greater value than four placed at random, and, following this line of reasoning, there is no waste in placing four posters in a continuous line. Placing more than four, in this manner, would probably be a waste of material. This only holds good where the posters are of the "type" variety, as a brightly colored picture is merely to draw the eye, and gives little information. To place more than one of the latter variety would be of no greater advertising value than a single sheet. If we want a larger spot of color we should increase the size of the sheet rather than the number displayed.

It is easy to see the effect produced by a line of similar type-posters, by posting a fence, in this manner, and watching the passing crowd. The passerby will read the first line on the first poster, the second line on the second, and so on. If the matter interests him, he will stop at the last poster and read it from top to bottom. If there had been only one poster, he would not have had either the time or the inclination to read it in passing. This is based on the same reasoning as the electric sign that gradually adds to its display until the entire sign is illuminated. It is then extinguished and starts over again. The observer's interest is kindled by his curiosity as to what is coming next, just as it is by a chain of posters, if the initial wording is at all clever or unusual.

The navy can do no better, in this matter, can to follow the lead of concerns handling marketable products. Their advertising is conducted by experts who have made it a life study.

(2) *Moving Picture Reels and Slides.*—Short of the display of an actual bit of the navy, such as a ship or naval station, there is no more effective way of placing the matter squarely before the public than through the medium of the moving picture screen. In this day and generation it reaches more people than all other forms of advertising combined, and their interest is held by what preceded and follows it, whether or not they are drawn to the naval display in particular.

For use in theatres, single reels are much preferable to features comprising several reels, as managers are always willing to place the former, whereas their programs are too exacting to permit of the introduction of three or more reels of navy pictures. A single reel, coming to them at no cost, will often tide them over a slight gap in their current program, as it is often difficult for them to obtain a single commercial reel.

With the adoption, by the recruiting service, of their own moving picture apparatus, serial pictures are valuable, but they are at a disadvantage in the commercial field, where it is often necessary to break their sequence by taking a single reel from the series. If the public see "The Making of a Man-of-War's-Man, Part 6," on the screen, for instance, without the other five parts, they feel cheated, although the manager who is under contract with moving picture distributors, cannot possibly find time to show the entire six reels. Civilians always have the impression that the recruiting agent is simply trying to get a lot of publicity without paying for it. Of course, they are right, although it is a case of not being able to pay for it, rather than not wanting to, but it devolves upon the recruiter to make them feel that they are really the gainers, rather than himself. If any recruiting station is so fortunate as to incur the obligation of a manager by helping him when his program is held up by traffic conditions, it will have no further trouble, from that manager, at least.

The manufacture of moving pictures is a most expensive business, but it certainly warrants greater activity than any other form of publicity. It shows the navy to the people as nothing else can in the undisguised revelation of a camera.

Managers are always glad to show stereopticon slides, although they prefer to get them a few at a time. Excellent pictorial slides can be reproduced from the weekly "What the Navy is Doing" supplied by the Navy Recruiting Bureau. The pictures can be

effectively photographed on a plate which, with the addition of the address of the recruiting station, makes a pleasing as well as business-like slide. With a new picture added to the collection, every week, the theatres are given plenty of variety and slides can be constantly shifted from one theatre to another.

Whenever any particular news comes to hand, such as the navy pay bill, the anticipated visit of a large naval display, etc., a very good slide can be made on the typewriter, lifting the ribbon and cutting a stencil on a piece of thin stencil mat. Carbon paper can be used, but with the former the letters are more clearly cut and circular letters are preserved in their entirety.

(3) *Personal Advertisement and Solicitation.*—We now come to the most important factor in recruiting and the backbone of its success. Posters, moving pictures and stereopticon slides are, after all, only rigid forms of advertising and are, at best, mute appeals to a man's curiosity, his desire for travel, or his business instincts. None of them can answer the many questions that arise in the mind of the observer, and the information contained in all of them must, perforce, be very brief.

All forms of advertising are valuable, and none of them should be discarded until their failure has been definitely established, but the man in uniform, thoroughly indoctrinated in recruiting salesmanship, can accomplish more in a few minutes' talk than several hundred posters. The recruiting officer dreams of publicity so perfect that navy posters meet the eye of the passer-by no matter which way he turn, and which he is bound to see unless he be a cripple or totally blind. In actual practice, however, posters will be few and far between except in certain localities where the conditions are ideal, and the owner of a half-mile fence happens to share the bill-poster's enthusiasm.

The real, live sample of the navy, his eye continually open to the main chance, his brain stored with navy lore, traditions and facts, and thoroughly drilled in the practical manner of making a sale, is what the recruiting service needs and what it must have if it is to compete with civilian business. Commercial organizations spend large sums in advertising, but they also maintain a large corps of salesmen whose incomes are directly commensurate with their selling abilities. A salesman, no matter what he is selling, reflects credit or discredit upon the concern he is representing by his appearance. This is a thousand times more important for the navy

salesman than it is for the civilian as, after all, the civilian is only asking that his goods be bought, without the added requirement that the purchaser live the life that has brought the salesman to his present station.

An officer or petty officer, purporting to be a representative of his service, who is slovenly in his appearance, is not taut about his clothes, or forgets to shave, may easily sway the balance against the navy or render null and void all the impression that has been gained by the poster or the illustrated booklet. There is a constantly increasing interest shown by the parents of our future navy and, with them, appearance counts a great deal more than it does to their sons. Neatness, in a recruiting agent is, therefore, not advisable but obligatory.

Salesmen can only be judged by one standard—the *results* they produce, and the only tangible unit is the enlistment. The market is there, better, to be sure, in some places than it is in others, but it is there, nevertheless, and the only way that a salesman can make an impression on it is by constant and unremitting work and devotion to his task.

As he gains in experience and skill his sales will increase and the novice who thinks that the business can be learned overnight has only to be put to this work, to be rapidly disabused. Every single waking moment must he be up and doing, and have the answer to every question at the tip of his tongue. His sale must be scientifically conducted, he must develop instinct in sighting a "prospect," and he must be able to combat every argument.

"Personal solicitation," as a topic, is no empty title, but means exactly what it says. The salesman must do the soliciting or some other business gets his possible recruit. He must go after his business as though his bread and his family's clothing depended on it. He must search the highways and byways for business and not wait for it to drop in his lap, or he should find his footsteps leading sea-wards and a more energetic man taking his place.

(4) *News Articles.*—Newspaper editors are, really, very long-suffering individuals. They are imposed upon as long and as often as the public can accomplish it and as they will permit. They receive, several times a day, reams of stuff that has no legitimate business except in the waste-paper basket, and they are constantly hounded by those over them to reduce the size of the paper and help combat the paper shortage.

There is only one answer to the question: "What will they publish?" and that is "*news*, of local interest, if possible, and what the *public wants*."

There is absolutely no point in sending them a half-column of navy advertising, disguised as a story, as they will simply give it one pitiful glance and throw it away. After they have done this a few times they will throw envelope and all away without taking the trouble to examine the contents.

If we discover the fact, however, that Mrs. Jones' son John slipped and bumped his head, the editor will accept it gladly, as all of Mrs. Jones' friends read the Daily Bugle and will be interested to hear of John's accident, or grieved, as the case may be. If it happens that John enlisted in the navy there is real foundation for a story for his *local* paper. The biggest paper in our district, probably in the town where the main recruiting station is located, will be satisfied with John's name and address, and the fact that he enlisted and this information they will always publish. The small-town editor, John's *home* scribe, will eat up the details, and give him as much space as the other paper would allot to a first-class fire.

We should, therefore, syndicate all of the papers in our district, making our list absolutely complete, whether some of the papers are published only weekly or semi-weekly. They are all vitally important and the editor of the country newspaper is as important, in his way, as the president of the Associated Press. Every enlistment should be reported, as part of a summary to the important paper, and as an article to the small one. If the applicant is a resident of the big city, a few facts may be added to the statement of his enlistment, but they must be very brief.

In addition to the above press stuff, which should become a part of the office routine, many occasions present themselves for legitimate articles, with enough news to suit the public. The proposed visit of a ship of the navy, detailed information after she has arrived and a sketch of the commanding officer and his naval career. Information as received from the Bureau of Navigation of interest to all ex-service men in the district, or activities in which any local celebrities have a part.

In fact, there are countless ways in which the navy may appear in print to the mutual benefit of the editor and the public. Articles of general interest should always be sent to all papers in the dis-

trict, and articles of local interest to the paper of the locality concerned, only.

In all items issued from a recruiting station, the recruiting officer or a member of his personnel should be quoted as supplying the information in question. Editors never like to assume the responsibility for statements concerning the navy, and if there are frequent interspersions of "the recruiting officer of the blank district states . . . . ," or "Chief Machinist's Mate Bill Jones of the local recruiting station says . . . . ," there is no chance of a come-back at the editor, and the editorial is in such form that it will not require much re-casting.

It should always be remembered that the editor has less of time and space than he has of any other commodities, and if we can place our articles in such form that he can hand it to a copy-boy without cutting out about three-quarters of it, our stock will be in the ascension.

(5) *Mailing Lists.*—A recruiting station can become a first-class mail-order house if this important activity is given proper attention. The possibilities depend, of course, on the equipment and the available personnel, but whether there is on hand an addressograph or whether all envelopes must be addressed by typewriter, a mailing list is absolutely essential if intensive recruiting is to be accomplished.

If a brand-new list is being established we can always obtain plenty of material from patriotic organizations such as the American Legion and Veterans of Foreign Wars. This will give us several thousand names as a starter. We can follow this up with information obtained from the census bureaus, employment agencies, and "hiring-and-firing" departments of large industrial concerns.

Next to the above, and other similar sources of names in quantity, applicants for enlistment, themselves, are the most prolific source. Very few men seeking information about the navy fail to produce the names of, at least, two or three of their friends whom they think might be interested. The best time to obtain this information is at the time the man is filling out his own application. His mind is then concentrated, he has a pen in hand, and it is much easier to direct his thoughts in this direction than at any other stage of his progress through the recruiting station.

To carry out the above plan, it is convenient to have a small card or printed form, bearing the following legend, or something similar thereto:

The following are, to the best of my knowledge, citizens of the United States, over 18 years of age, and would be interested to know about the navy, as applied to their particular cases.

Below this appears space for four or five names and addresses. It is also a help if the applicant is requested to write on the back of the card very brief notes about each man, to give the writer of the prospective letter some inkling regarding the man's qualifications and present occupation.

This system has been used to the greatest success, not only with applicants, but with every member of the recruiting personnel in the field. Each recruiting agent should submit a daily report on his activities, similar to that required in any concern employing bodies of salesmen. On this report is entered the names of all men interviewed, with the exception of those actually brought to the recruiting station and enlisted.

The names obtained from all sources are summarized for the day, passed to the publicity office, and a letter is sent to each man, worded to suit *his particular* case. There is nothing that tickles a man's vanity as much as to receive the impression that someone else is interested in his particular case as separated from all other cases. As the navy embraces practically every trade, so it has the answer to every man's question, and if such a letter, beside giving the advantages of the service in general, states, explicitly, what it can do for the recipient, he is bound to read it from beginning to end, and give it serious thought.

In many cases, particularly with the men whose names have been obtained from applicants, we have no information except their names and addresses, and the only solution is a form-letter, so worded as to avoid the appearance of a "form," and made as straight-from-the-shoulder as possible. As the work progresses we can develop numerous form-letters, to suit men of different walks of life, men who have had previous military or naval service and men who have not, but all of them should, whenever possible, be signed by the recruiting officer. It is somewhat arduous to sign several hundred letters a day, but it makes all the difference between a personal and an impersonal message. A good multigraph

with a signature attachment can do the work pretty well, but nothing fills the bill as well as pen and ink.

A mailing list has almost infinite possibilities, and the results obtained from it will be gradually accumulative. It should be paralleled by a card-index system, which should be kept strictly up to date. It takes some time before the results are apparent, but, once in full swing, 25 per cent of the weekly enlistments should appear in the files.

With all the modern appliances for producing letters and addressing envelopes, the mailing list may gain in sheer weight what it loses in the personal element, but it is believed that quality is preferable to quantity.

(6) *Speech-Making.*—The opportunity should always be sought, and it often arises of its own accord, of addressing bodies of men on the subject of the navy in general.

It is manifestly impossible to reach such a perfect dissemination of information that all males between the ages of 17 and 35 and, in particular, those who have had military or naval service, hear our message. The best we can accomplish is to talk to them singly or in groups, and the larger the group the better. Every man, woman or child is a good subject as what does not apply to the individual case will always be passed along to at least one other person.

With the business proposition that the navy offers to-day, it is certain that everyone not permanently established in a lucrative position is bound, in his own self-interest, to listen to it when it is expounded. Every recruiting salesman should, therefore, have in his mind several short addresses on the navy suited to different types of audiences. These must not be stereotyped, but should lead right to the point and follow a line of appeal commensurate with the intelligence of his listeners.

In order for the delivery of a speech to be effective no oratory is required. The talker must simply know his subject and have a sufficient control of language to drive home his point. He must not deal in innuendos and must not say anything that he cannot prove.

The first point is to "size-up" the audience and then talk about what would interest *them.* Just as the first point in salesmanship is to find out what interests the customer, so in the making of speeches the attention of the audience is of paramount importance. Once it is lost, the best thing to do is to drive home one or two vital points and close the argument. Briefness, conciseness and a dic-

tion that will reach to the limits of the audience, and of which every word can be understood, are the prime essentials. Use the simplest words that will express the intended meaning, do not hurry but keep the talk from dragging.

There is not believed to be any exaggeration in the statement that everyone in the United States is interested in the navy. The navy is at the back of the heart of every American citizen, and it is not simply mob spirit that prompts the hand-clapping that always greets the appearance of a man-of-war on the screen. If there is any fault to find with the spirit of the public in its relation to the navy, it is that, individually, people are more enthusiastic about the navy in the abstract rather than in the concrete. The American mother is more often enthusiastic about seing some *other* mother's son in uniform.

The reason behind this state of mind, and which we must strive to counteract in our speeches, is believed to lie in the enormous fund of inaccurate knowledge that has spread from one end of the country to the other. The recruiting petty officer with the badges of long service on his sleeve, has many opportunities to dispel much of the mystery surrounding his service and, most of all, to counteract the influence of the man who has been all of six months in the navy, was discharged with bad conduct, and is regarded as a prophet in his own country.

It is impossible to call to mind any other profession that is so subject to the damning influence of a "little knowledge," which is never more dangerous than it is in this connection. Neither facts nor figures ever lie, and the incontestable argument is at the disposal of every officer and man in the service. He who is ashamed, afraid or too modest to use it, has no business on recruiting duty.

(7) *Miscellaneous.*—Every phase of recruiting publicity depends for its success upon seizing the main chance and, moreover, watching for its approach. Any proposed gathering affords an opportunity of placing the navy before the public, be it in circus parade, bicycle race or prize fight. The daily papers should be closely scanned and are of the greatest assistance and the recruiter should always have his "ear to the ground."

It is particularly true in the United States that novelty is the keynote of any advertising scheme, and the business of advertising the navy requires considerable variation to keep it from going stale. Aeroplanes are a comparatively recent venture, but the

country has always had its navy, and is inclined to treat it, more or less, with the contempt that is bred by familiarity. To make the public take notice of something that has always been there, like the sun or the moon, dynamic advertising is required and should be carried on, within the limits of good taste.

SUMMARY

RECRUITING SALESMANSHIP

Recruiting activities, as undertaken at the present time, require a fixed doctrine and a standardized method of approach. Times have changed, intensive operation is mandatory, and all men coming to recruiting duty, under the present régime, must disabuse their minds of any systems, methods, or plans of campaign to which they have previously adhered. In this connection we would prefer to have men of no experience, men who are willing to learn a new system in a new way, and all that is required is an agreeable personality and a willingness to accept the established doctrine, whether or not it agree with their own ideas on the subject.

One doctrine and a single method of procedure will, if properly established in the service at large, effect much greater results than innumerable systems practised at the volition of the individual. We will, therefore, assume the adoption of a doctrine as hereinafter outlined.

(1) *Salesmanship.*—To "sell" an enlistment in the navy is no different than the marketing of any tangible product, and the fundamental success of all salesmanship is based on the inherent principle of *selfishness.* Every individual is more interested in his own affairs than he is in the concerns of his fellow men, unless he be a minister of the gospel and, even then, it would be difficult to prove the contrary. He may appreciate the interests of his friends, will listen politely while they expound their theories and will exhibit deep sympathy at their troubles, but, when it comes to the final analysis, it is his *own* business that directs his conduct. Hence the very foundation of salesmanship: *Look at the proposition through the other fellow's eyes.*

To sell a psychological proposition like the navy is more difficult, in one way, than to sell a mechanical toy, a sample of which we carry in our pocket; but, viewed from another standpoint, it is much easier from the diverse fields of interest that it covers. An

electric flatiron interests only a housewife, or a man who deals in such articles, but an enlistment can be made of interest to any man, of any trade, between the age limits and, moreover, to those interested in his welfare.

There are two prerequisites of salesmanship and two only. These are:

(a) An absolute knowledge of the line of goods.

(b) Confidence that the line of goods that one is handling is better than *anything* on the market.

Before sending our salesmen on the road, we will, therefore, assure ourselves that they have the necessary requirements of an exhaustive and detailed fund of information regarding the navy, and the conviction that it is the best proposition in existence.

(2) DOCTRINE

The sale must pass progressively through the following stages:

(a) Attention.
(b) Interest.
(c) Desire.
(d) Conviction.

(a) The prospect must be attracted to our product.

(b) It must appeal to him and hold his interest.

(c) He must be made to *want* it.

(d) He must be convinced that unless he possesses it he will never realize the ultimate success from life.

Our *doctrine* requires that the four cardinal points be *always* covered in the same order and that each be fully covered before the succeeding one is opened.

It makes no difference whether the applicant is encountered on the street, is met at the railroad station or walks into the recruiting station, the *doctrine* holds goods.

Unless the line that interests him *most* is determined at the outset, the sale may be landed, but it will be more good luck than good management.

(3) THE BAG OF TRICKS

1. Travel in a way that only the very rich in civil life can afford.

2. Learn a trade in better schools than exist in civil life.

3. Athletics and recreation, provided and systematically supplied by the government.

4. Assured promotion and *always* room at the top.

5. Healthy life. *You* get free the greatest cure for all ills, the air of the open sea.

6. The only concern in the world that gives a man money to spend, allows him to spend it *all,* and provides him with an income for the rest of his life after 16, 20 or 30 years' service.

7. Life or endowment insurance at rock-bottom prices.

8. Free food, lodging, recreation, medical attendance and clothing.

9. A steady job, whether outside business is good or bad.

(4) THE RECRUITER'S KIT

1 small handbag, similar to a brief case.
1 small note-book and pencil.
Local time tables.
1 pocket street directory.
3 each trade pamphlet.
1 copy of all the very latest information on enlistments, trade-school, rates of pay, etc.
1 copy of recruiting instructions.
1 arm brassard.
1 assortment of photographs of trade-school, ships, etc.

(5) THE RECRUITER'S CREED

I will keep my eyes open *every minute* for a likely prospect.

My constant thought will be "What can I do for recruiting, *now?*"

I conscientiously believe my proposition to be *better* than anything on the market.

Is there anything that I do not know about my line?

My personal appearance will always be above reproach.

I will never make any statements that I cannot prove.

I will follow the *doctrine* in making every sale.

I will never lose my temper.

I will never lose my sense of humor.

In selling my goods, I will *never* be ashamed, and I will be afraid of neither man, God, nor devil.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A TACTICAL AWAKENING

By COMMANDER JOHN STAPLER, U. S. Navy

The question is, is the navy awake to the importance of complete tactical knowledge and co-ordination in every form of battle effort?

The decisive fleet action of to-day bears so directly on national destiny that failure to properly combine every type of weapon should be securely guarded against.

The World War has contributed a remarkable advance in all classes of ships, both sea and air. The gun, torpedo and mine have laid down new restrictions on battle movements. Modern sea action with its high speed and increasing number of distinct types of ships and weapons has become a complicated problem. The relatively simple requirements of battle in the sea actions prior to the present period, stand out in comparison. Then, an understanding of the capabilities of the main fighting strength, the ship of the line, in accordance with the general battle plan, was sufficient. The need of dove-tailing in the striking power of half a dozen different weapons so that their blows might be delivered in the proper sequence, was not a subject of study. Communication had not reached its present vital importance; nor had the bearing of an efficient service of information both air and under sea been borne home.

Modern battle is dependent upon so many elements that must be harmonized to gain complete success, that it becomes a subject for constant study and experiment. The danger is, that the daily humdrum of routine, and the ever-lasting demands of material upkeep, and individual unit training, so occupies the attention of officers in command, that the need of battle co-ordination between commands is lost sight of. One class of work is ever present, pressing at the elbow in its procession of reports and papers. The

other is less tangible and demanding in attention. It is accepted as important; but the ever insistent details of individual operation tend to keep it, more or less, just over the horizon of accomplishment. This makes it, however, none the less vital in the ultimate day of battle.

Present sea action unrolls in rapidly moving phases in all of which the various weapons have definite tasks. Not only must the general battle plan be understood by force and individual commanders, with a thoroughly grasped force doctrine of action to meet the varying battle stages, but there must be the appreciation of what the other task groups or forces are thinking and propose to do in meeting any one of a number of particular situations.

This can only be accomplished by a system of battle training which holds those deciding hours of the future ever before the eyes, and makes their meeting a matter of paramount daily importance. All else should be secondary in interest to the commander. The preparation of the weapon is essential, but of what use is the weapon if it cannot be used in full effectiveness after it is prepared? A number of officers can assist in the preparation of the weapon, both material and personnel, under the general supervision of the head; but there is but one officer in each unit to make the tactical decision in battle, and that is the leader. Seconds then mean much to a nation, and the responsibility is great.

TACTICAL STEPS

The ship ready to fight is a requisite step to its tactical employment. Ship handling, whatever its form, and the use of its weapons are the foundation of tactics.

The next step is the combining of the tactical efforts of a number of units of the same class. Various forces of similar type appear in tactical training.

These two steps are, in general, fairly well reached by the navies of the world. But it is the third and final step, the combining of all the forces that go to make the modern fleet in action, to which the searchlight of attention should be turned. The previous steps are of but little value, if this, the last and all important, is not thoroughly explored. In view of the rush of recent naval development, and the requirements of modern fleet action, has the service adapted itself to meet the increased demands of preparation for tactical leadership?

JUTLAND

Some points in this battle are briefly touched, to emphasize the importance of the tactical co-ordination of the fleet in action.

Service of Information.—Throughout the battle attention is called to the fact that a more successful service of information, before and during the action, would have meant much to both the British and the Germans. Neither fleet realized the proximity of the other, until a chance contact between the light forces developed. There was but little time then for any change in the general dispositions.

Weather conditions had been such that the German Zeppelins attached to the High Sea Fleet had entirely missed the Grand Fleet. This applied in part to the submarine patrols. On the other side the British, apparently, had failed to receive word of the sailing of the German fleet.

Communications.—The failure of communications at critical points during the progress of the battle, points to the need of the utmost attention to this extremely important subject. Had the British commander-in-chief more complete information of the enemy dispositions just prior to the contact between the main battleship forces, it is certain, that the British battle deployment would have been completed before the enemy was sighted by the main body.

With close gun action in a superiority of nearly two to one from a position ahead of the German advance and with the British battle cruisers and destroyers massed on the German head of column, the few remaining minutes of daylight would have been sufficient for the British. The delay that resulted from the deployment of the British battleships after sight contact gave the Germans their chance.

Tactical Co-ordination.—An excellent example of tactical co-ordination is presented by the German retirement at 6.30 p. m., from an extremely critical position. It was accomplished by a simultaneous ships right about from a bent column formation in which the head of the column was being forced around to the southward. In conjunction with this maneuver, a properly timed German destroyer attack was thrown against the Grand Fleet, and smoke screens were laid to cover the German withdrawal. The Germans only lacked the presence of fleet submarines to make the attack of the delaying screen complete.

This maneuver was successfully executed; and in illustration that it was not a matter of chance, it was repeated under almost similar conditions at about 7.20 p. m. It was full tactical appreciation and study by the German command that had prepared this maneuver for the situation that actually developed.

The night phases of the battle were examples principally of the need of reliable information and communication. The two main bodies were in proximity to each other, and yet were out of touch. It was unfortunate that the British were unable to so concentrate their light forces as to deliver a simultaneous destroyer attack on either bow of the German advance during darkness. This to be followed at daylight by renewed attacks, supported by the guns of the Grand Fleet from an intercepting position off the Horn Reef minefields.

The Germans likewise seemed to have completely lost touch with the Grand Fleet after 9 p. m. Their night destroyer attacks failed, due to their inability to find the British. Yet the two opposing main bodies were relatively close to each other. The importance of holding contact with the enemy main strength, once it is established, and of maintaining efficient communications, is seen. There was failure on both sides to mass submarines on the line of action.

At Jutland the Germans steamed into a superior British concentration. They escaped through their tactical skill.

TACTICAL PREPARATION

Leadership in battle is the distinct and privileged duty of the line officer. The demands on command to meet the tactical requirements of future fleet action are so great, that a full realization of this utterly important subject is necessary.

How then can this tactical preparation be best secured? A study of the tactical progress especially in its relation to the organization for tactical work recently employed by the principal sea powers, will furnish a certain amount of suggestion.

With this should be combined the particular requirements of our service. It is evident that the modern unit of naval command has reached a point of considerable administrative complexity. There is need of additional officer personnel with a somewhat

altered routine of daily duties. This to meet the new demands of fighting efficiency and tactical preparation.

To further the examination of the subject and to present some constructive suggestions the following phases are discussed:

Tactical Opportunity for the Leader

The captain of a ship should be relieved so far as possible of the minor details and routine of ship or force administration. He should be largely free from time consuming reports and paper work. Details of duty assignment, general policy and inspection are logically for his attention. With the time thus saved from small matters, he will be able to study his command from the battle preparation and tactical handling point of view. In addition, he will have the opportunity to gain the knowledge of what the capabilities are, and what action may be expected during the varying stages of battle, of all fleet types. Only so, can absolute fleet co-ordination be obtained. Not only must he know what his own command is to do to meet a given situation, but he should know of what the other fellow is thinking and what he will probably be doing five minutes hence.

There is need of a tactical aide for the leader. In the case of a captain of a ship, this aide may well be the navigator. The navigator's duties should be adjusted accordingly. A War College course, and tactical instruction, should be part of the requirements of both of these officers before assuming their duties afloat.

The executive of a ship might well take over many of the details of administration and routine, which now occupy the captain's attention; and in turn, an executive aide, an officer of rank and experience should be assigned to each first rate ship to assist the executive in covering the increased field of his activities. The first lieutenant to continue his duties as at present. The modern battleship has reached a point in development, where sufficient officers should be provided, if there is to be an adequate planning and efficient tactical preparation at the head.

For a commander of a division of ships it would be well to have an officer of experience detailed as tactical aide; and in the case of a squadron commander, this officer should be of captain's rank. On the staff of the commander-in-chief, the tactical aide should be an officer of flag rank, and should be in addition to the chief of staff.

Besides the above, all fleet and force staffs should have representatives of the various fleet types as liaison officers. These officers to be connecting links with the particular element of the fleet which they represent. An appreciation of type capability would be one result of their presence on the staff. They could aid materially in war games, and in tactical war preparation, and in the dissemination of general information. Thus a destroyer aide, a submarine aide and an aircraft aide would be found on the staff of the commander-in-chief.

The Germans early realized the importance of adequate officer assignment to ships, and of installing a system whereby there was a natural flow of tactical information. The demands of the future will be much greater in this respect than has been the case in the past.

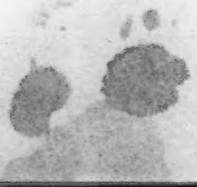
The Game Board.—Wherever possible, tactical game boards to be installed afloat and used for study and test purposes. All sea tactical maneuvers can be played to advantage at the game board, as a preliminary to the actual getting underway. The maneuvering of the fleet with all its component parts present, is necessary for a proper appreciation of the effect on time and space of battle speed. But the game board can prepare the way, and the sea maneuvers when executed will be more progressive as a result of its work. It would be well, if the new ships in building had installed a tactical game room compartment with its necessary equipment.

Tactical Study.—The establishment of a Junior War College course, as has been proposed, would aid materially in tactical preparation. This combined with the War College extension course and an expansion of the present War College to meet the requirements of all present flag and command officers would do much during the next few years in preparing the fleet and in holding it tactically ready for battle. And unless a fleet is tactically abreast or ahead of the times it is but a poor investment.

The whole subject of tactics is one that of necessity is in a state of flux. The force doctrine of attack of to-day, changes with new developments. Therein is the need for constant study, and for a tactical fleet organization that will readily disseminate and keep up to date all tactical information.

As examples for study the following are mentioned:

(1) Battle signals and communications of all types.



(2) Co-ordination in battle effort of the different fleet forces for the successive phases of action, day and night.

(3) Use of smoke screens with all classes of ships, and the employment of indirect fire control.

(4) Tactical scouting with the employment in combination of aircraft, and submarine.

It is in the fleet that progress must be made. Courses of instruction, as at the War College, prepare the mind and point the way. Full progress can only be made in the fleet where all the elements are present for sea test.

It is time that we as a service raise our eyes from the deck to the horizon, and the importance of tactical preparation.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE QUALIFICATIONS FOR LEADERSHIP

By LIEUTENANT (J. G.) C. C. CARMINE, U. S. Navy

In the great crises of ancient and modern history, at times when nations have fallen, the geographical outlines of countries changed, affairs of states become revolutionized, and the trend of the masses has brought about some startling transition, there has always loomed up a great figure, one who has risen head and shoulders above his contemporaries, a leader who by military skill or the genius of professional sagacity has "hitched his wagon to a star"; around whom the hopes and the ideals of the multitudes have clustered.

Alexander led his people to the attainment of mastery over half of Europe and Asia Minor; Hannibal established the principles of Carthage in the courts of his numerous conquered vassals and built up a great empire rivalling that of Rome; Cæsar, the acknowledged sponsor of Roman culture and military success, raised up the mightiest of ancient governments to a pinnacle from which only the loss of his own stimulus in governmental affairs caused its downfall. In more modern times we find the first bickerings of the great Prussian kingdom centering around the prominent figure of Frederick the Great. Following him a half century is the man who dragged France from the chaos of social anarchy, riot and bloodshed to that of the first power of the European continent. Bonaparte, by the sheer force of his example of leadership, clutched France from the depths of despair, organized her masses, set a definite goal, led her to triumph, and then by fallacies in his own character lost a great part of what he had gained. Yet the lasting example of leadership he had given when he was at his best became so inculcated into the life of the people that France never forgot. It is upon the structure of those principles laid

down by Napoleon, the man, that the modern French republic is constructed. There are more examples, too numerous to exploit in a brief treatise of this kind, how the force of leadership of a single man has altered the destinies of peoples and wrought changes in the political fabric of nations. No better record can be found of the tremendous power and influence of leadership than in a study of past history, and frequent references will be made to the lives of the great fore-runners whose characters individually and collectively afford the most concrete examples of successful leadership.

Jomini, Marshal Ney's chief of staff, states: "The most essential qualities for an army leader will always be; a great character or constitutional courage which impels to great resolves, then sang froid which impels to bodily courage which conquers danger, knowledge appears only in third line but it will be a strong help, one must be blind not to admit it." What Jomini says of an army leader is equally applicable to leaders in all branches of civil and military life except it is not agreed that knowledge should be placed in a subordinate position to the others.

The two great qualifications for the leadership of men are those of intellect and character and the proper balance between the two may be stated as a third. That knowledge is of main importance is definitely proved in a study of the careers of past leaders. For instance we know little of Cæsar's youth and ambition to learn, but we do know, as Lieutenant Colonel Dodge, U. S. A., states in his works, that no man in his legion worked harder than Cæsar himself. He did not labor diligently until he had acquired a thorough understanding of military strategy and tactics and then rest on his laurels, nor did he cease when a full knowledge of governmental affairs was encompassed within his mind. Cæsar strove continuously, studiously, conscientiously in the interests of Rome, her government and her people. It was the ambition, the desire to learn more and to rise one step higher; and never tiring, never allowing himself to be satisfied with one or two great victories or achievements; Cæsar led until the moment of his betrayal and death.

Napoleon, in his student days at Brienne, was noted for his intense application to his studies. We find a statement in John C. Ropes' "First Napoleon" of the great French leader's premier virtues as being, "his untiring industry, his devotion to the pub-

lic service" and that "he studied continuously." Furthermore we read that he wrote commentaries for his own use on the campaigns of Cæsar in Gaul and the strategy of Frederick in Silesia and Saxony. These are statements about a man with definite ambitions and the will to accomplish through the acquisition of knowledge. Realizing the great field for operations in a military profession, the multitude of opportunities offered a skillful strategist and tactician, he never failed to perfect himself when the opportunity was available, by study and personal contact with situations which would teach more. We see him at Toulon as a major of artillery handle a situation too complex for commanding generals on the scene and from there through a program of commands to the leadership of the Army of Italy. Never relaxing, one step led to another until France was at his feet and then Europe. He failed finally in that his personal ambitions ever pursuing his better qualities finally overtook him and swamped him in a myriad of costly blunders which resulted in his downfall. The lesson to be taken from his career is not in his ultimate failure, for that was purely personal, but in the fact that, like Cæsar, he worked, he studied, he was relentless in a study of the details of his profession and in ever accomplishing more.

As types of brilliant leadership these two characters of two separate eras demonstrate the first and foremost truth that knowledge is essential in the human fabric of the successful leader. Thumbing over the pages of history there is not a single illustration of the true spirit of leadership as recognized by the mass's acknowledgment of such superiority and the striking results attended by such which was not based upon this fundamental principle of ambition to perfect and improve by application to study and the setting of a plane one step higher than seems possible to attain.

The man in command must endeavor to comprehend as much about the duties of his subordinates as do those subordinates themselves in order that he may intelligently issue orders and instruction to them. This may seem a broad statement to make, but it is merely a principle, and should not be applied necessarily to extreme cases. Picture the coxswain of a lifeboat who knows neither the theory nor the practice of lowering a boat in a heavy sea issuing orders to twelve men in the emergency of "man overboard" at sea. Imagine the water-tender, who has never experi-

enced a casualty on a boiler, who has never read nor studied safety instructions, and who understands nothing about a boiler except what he has been forced to learn in daily routine work, giving commands to his men when a tube bursts. Then too the gun captain who has learned nothing more than is required of him in the daily opening and closing of the breech mechanism—fancy the clearness and commanding force of his orders to the gun crew when a powder bag breaks and powder is thrown around the turret chamber.

These are but practical illustrations of the fact that to become a leader a man must know not only what he individually is required to do in all cases. The principle stated assumes tremendous proportions when we contemplate the gigantic task thus demanded of the admiral of the fleet or the commanding general of the army or the president of the shipbuilding corporation. It must be remembered, however, that these positions are obtained only by years of constant work and demonstration of capability. Knowledge is one of the first main factors in attaining that success of ultimate command of the whole, and though it is not possible to absorb all of the knowledge which this great world offers, nor which any particular phase of it offers, yet it is the percentage of perfection, the multiple obtained in the relations of knowledge obtained to that capable of being obtained upon which is based the degree of success and the rise to power of a leader. To be a perfect leader is then as impossible as to be a perfect man but to aim to be a perfect leader in the practice of the fundamentals and from this fact to first of all aim to acquire all of the professional knowledge possible in the short time allotted to us on earth is axiomatic. Leadership involves power—power over masses and over things. Knowledge is power and by mathematical substitution knowledge is leadership.

The second main factor in an analysis of the subject of leadership, that of character, embodies many of the features comprising the element of knowledge and the two are very closely related, especially in the consideration of ambition which is the basis of character and a necessity for the acquisition of knowledge. Rear Admiral Stirling has declared with keen insight into the problem that "for a military leader qualities of character that have the greatest weight are decision and good sense." Speaking of the qualifications for officers Major-General Shanks, National Army,

reiterates the same idea, "Of all essential qualities common sense is easily first and foremost." This is a large subject, common sense, and embraces very nearly the entire subject of character to say nothing of knowledge and intellect.

Laws and regulations are nothing but pure common sense. Cain slew Abel and realizing that murder would eventually exterminate the human race it became a commandment, "Thou shalt do no murder." Vessels propelled by steam or other machinery are handled with greater facility than those propelled by sail power. Hence it has become a law for the former to keep clear of the latter. To exercise common sense in the execution of his duties a leader must conscientiously and thoroughly analyze any question which comes to him for solution and he must arrive at a conclusion founded upon acknowledged practice and truths, the justice of which cannot be questioned. The man in command cannot be so overwhelmed with his own importance nor officious to the extent that he is unable to pronounce common sense judgment in matters of seemingly trivial importance. Think of the young army officer who would not form his company in single file marching through a narrow ravine because the drill book specified the column of squads as the natural marching order. History tells us that Braddock refused to take Washington's advice to deploy his men and fight as the savages fought because English regiments had never battled that way before. Not so very long ago an officer on a vessel undergoing full power trials failed to take the necessary precautions to prevent the explosion of her boilers because a superior officer not on the scene of action had ordered him to hold out a little longer with the resultant loss of some fifteen or twenty lives. Though the above are examples as much of the lack of appreciation of the value of initiative yet they are flagrant illustrations of violations of established rules of common sense as well as self-preservation, the first law of nature.

Common sense is nothing other than the basis for all good traits of character. There is a correct method and an incorrect method and variations of both for the attainment of the qualities of successful leadership, and the shortest course is founded entirely upon the aforesaid principles of common sense.

There is secondly the element of character known as personality. Why do some men impress their ideas and their beings

on a group of men more forcibly than others? Why does one manager and one gang leader produce greater results with the same number of men than another? Why can one officer take a division of men on board ship and achieve what seemed impossible for another officer with the same men? These questions may all be answered in the simple statement of force of personality. Personality is very often the product of heredity and more often that of environment though neither of these should be a restriction to a man. The great number of self-made men in the world without the advantages of either and often with many of the disadvantages of both are sufficient proof of the above declaration. Personality requires the ability to think clearly, talk forcibly, act quickly and the maintenance of a well-groomed personal appearance. The man with habits of neatness and cleanliness in dress is the one who attracts attention in a crowd. Give him a chance to speak and if he rises to the occasion, talks with force and emphasis in a clear manner the impression he will create will be of such a nature as to place him as the acknowledged leader of that crowd immediately. Place the same man before another group to which he has been arbitrarily assigned as leader and unless he possesses the above qualities to some degree, unless he presents the personal appearance of one logical to command, his leadership will be founded purely upon the thin threads of forced discipline. Thus it is in the military services with the commissioned, non-commissioned, or petty officer who without personality commands by virtue of his rank only, a meager something which requires the backing of an entire code of laws to be of any value—surely an artificial leadership.

Some people attribute little importance to the ability of speaking clearly if they can think clearly but what good are thoughts encompassed within the mind of the individual, thoughts which should be disseminated and put to practical use. The iron ore is of little value below the surface of the earth, but how different when it expresses itself in the form of locomotives, buildings and bridges. Of course those who express their ideas with the pen or the brush are leaders in one sense, leaders in the field of art. Leadership requires the clear expression of ideas in such a manner as to enlist support and co-operation. This may be accomplished either by writing or talking and, whereas writing carries little of the force of personality, except the tabulated opinions of the

author without the stimulus of his actual appearance to further emphasize his ideas, it follows that speaking is the logical medium or at least the one more productive or results in the distribution of the magnetism of human leadership.

In our great law-making Congress where debate and free speech are the most fundamental of rights we find the political, economic, and diplomatic leaders of the nation public speakers. The attainment of their positions of importance, necessitated appearing before their constituents and expressing in as convincing manner as possible the principles of government which they and their party represented, else how could they have hoped for success? They certainly could never have counted on election by a campaign managed entirely from the editorial pages of a newspaper or magazine; for the people of this nation and any nation in fact demand to see and to hear the men who are going to manage the affairs of state, to judge for themselves the special qualifications of those who aspire to leadership and no volume of argument on paper, no statement of a party platform by the national committee will take the place of that appearance and speaking in public before a crowd which the people have always demanded. We shall never live to see the day in this country when the stuttering, stammering blockhead who can pen a beautiful essay or a convincing argument or a brilliant editorial will be voted to the eminent positions of leadership in the affairs of government.

The ability to act quickly is one best acquired by experience and preparation. A leader is tested in an emergency, whether it be on board a sinking vessel, in a burning house, or at a state discussion where affairs of nations hang on the words and letters of a few assembled statesmen. Not all are blessed with that combination of good and bad fortune which allows us to be placed in positions requiring quick action or to witness emergencies from which we escape unscathed. Consequently it is essential to have one's mind prepared to act with judgment, common sense, coolness, and rapidity in all emergencies whether of a minor or major character. What would you do at sea in an open boat, a compass, a set of spars and a boat full of frightened women and children to make the best of your way to land? What would you attempt in a crowded theater if fire broke out? Suppose yourself in charge of a water tube boiler when a tube bursts; what course of action would you pursue? A man's clearness of conception of

his duty, the quickness and coolness of his action in each of the above cases as in thousands of others are what test his mettle as a leader. "All's well that ends well" is a very appropriate phrase but things can only end well when the unforeseen is prepared for ahead of time. A ship at sea is supposed to steam or sail gracefully over the waters but what if she strikes an uncharted rock or by inaccurate navigation piles up on a wave-swept beach? The situation immediately changes from the common everyday occurrence of a vessel at sea into an emergency requiring careful leadership based upon a preparation for just such an emergency beforehand. The responsibility naturally falls upon the captain; and to be the leader that his post designates him, he must act calmly and quickly or all is lost in a panic of human beings seeking safety. One false move on the part of the leader and either another must rise to take his place or there will be a mad rush and scramble for boats and life rafts with the attendant disastrous results.

Two of the greatest figures in history who possesed this valuable personal asset of acting quickly on occasions demanding it are those of Napoleon and in our own national life "Stonewall" Jackson. In practically all of his engagements the French emperor was confronted by forces greater than and many times double his own. To strike at the right spot with overwhelming numbers and an inferior total force was ever his problem; to suddenly cease action in one locality to concentrate in another his task. When reports of operations of his troops and those of the enemy came to headquarters fancy the rapidity with which his mind must have functioned to have grasped the entire strategic situation; picture him standing before his staff of officers issuing orders for action clearly and definitely with a force and precision which few great leaders have equalled and none have surpassed. To accomplish the end of victory he could neither vacillate nor wait for further information to weigh his intentions in the balance. Immediate action was always required. We can only conjecture the rapidity with which Jackson's mind must have operated, the promptness, the clearness and accuracy with which orders must have been issued and executed to have achieved the glorious results of Chancellorsville where with sixty thousand men he forced defeat upon a combination rated at from one hundred and ten to one hundred and thirty thousand. Both cases are splendid illustrations of the results which the qualifications of

clearness of thought and rapidity of action may attain for a leader so endowed.

That the element of the personal touch enters largely into the makeup of a man's and a leader's character is demonstrated in every daily meeting in every branch of life. By personal touch is meant that keen sensibility coupled with the due exercise of common-sense which inquires into and understands the feelings and points of view of fellowmen, that personal magnetism which attracts others to confide their difficulties and problems, that ability which sees into the depths of the soul and comprehends. This is a tremendous virtue and involves those intrinsically important features which make an individual stand out in the capacity of leadership; those of kindness and impartiality, cheerfulness and firmness, justice and promptness.

Then there is that word in the English language about which the experiences of the recent war have prompted so many criticisms and opinions. It is called discipline and the reason is two fold. First of all many men were jumped to the positions of leadership who were not fit leaders in the true sense of the word and whose only guide was a set of regulations laid down by a War or Navy Department; secondly, the greater part of the host of American youths was snatched from lives of comparative freedom and independence to one of subjection to iron-bound rules of action and codes of laws seemingly unnecessary and at times rather harshly executed. It was the sudden transition in both cases from the civil to the military, neither of which thoroughly understands the other, that wrought the many difficulties and misunderstandings.

Leaders cannot be made over night; a man cannot be given a commission, a uniform and a set of regulations and then expect that he will be the acknowledged leader of his command by virtue of these gifts alone. He may apply the cast iron rules to every situation which arises; he may answer every question by reference to his little blue book; he may catechise as from the bible itself but he will lack that quality known as radiance of personality, that personal touch which characterizes the real leader from the empty uniform.

The secret of success in the attainment of this so-called personal touch, this close intimacy with fellow-beings lies in adaptability; that is, the ability to place one's self on the same plane with

a subordinate and by force of example to demonstrate the qualifications for leadership. The foreman who can handle a pick and shovel and will use them to demonstrate the correct method of digging a ditch has placed himself on a level with his men and has shown them practically that his ability to command them is based upon a full knowledge of their task and not upon some flimsy structure of social position or "stand-in" with the boss. The lieutenant who can and who before a company of his men does handle a rifle with dexterity and accuracy has perhaps sacrificed for a moment the more dignified appearance of wielding a saber but has demonstrated the fact that silk gloves and a polished scabbard are not alone symbols of his ability to lead them. The young ensign who can and does splice a rope for the instruction of his men; who can and does use a shovel or slice bar to demonstrate the proper method of firing a boiler; who dives down and blackens his face and hands with the toil and sweat of honest labor is the man who will be naturally and unqualifiedly hailed as the leader of his men. He has not faltered in getting down to rock bottom, in adapting himself to the conditions of those who work under him, in understanding their hardships and comprehending their points of view. He cannot fail to have that personal touch with his subordinates which characterizes the true spirit of leadership.

It must not be assumed from the above statements that a man must get out and shovel dirt to create the impression of practical ability. It is merely that spirit of willingness to do so if necessary, that desire to understand those men whose daily task it is to build or tear down and to lead them in security and contentment to the accomplishment of some objective.

This concludes the discussion of the many elements which combined create personality, one factor essential to successful leadership. It is this spirit of co-operation, of mutual concession between employer and employed, officer and man, leader and follower which will ultimately achieve the results that an organization may hope to attain. Lincoln commenced his career in a log cabin in Kentucky, later split rails in Illinois, and still later succeeded to the leadership of the great body of American people of all states. Lincoln never failed to understand and appreciate the laboring man of the nation; he had been one himself and could readily comprehend their status in the society of mankind and

their outlook on life. Washington had from experience become thoroughly versant with the habits and customs of the pioneers, the savages, the backwoodsmen, and the more organized class of colonists. America has never had a more comprehending leader of her heterogeneous masses than her first president. He had never feared to labor with his hands as an aspirant to success and when the first office of the land crowned his final efforts who can doubt but that Washington if challenged would have stooped to fell an oak, wrap and tie a bale of tobacco, or handle a flintlock. The spirit of co-operation between the people and their acknowledged leader in these two cases manifested itself finally in the accomplishment of that for which they both strove. Imbued with the ardor in the one case of establishing the Union and in the other of preserving it, the American people finally attained success through and with the acknowledged leadership of those two great characters, who led not alone by the rigid wording of the Constitution but by the principles of justice and common sense, by the exercise of that co-ordination which will always elevate to greater things and produce results of a higher order in a combination of human beings led by such personalities.

Cheerfulness is an easy thing to talk about and to think about, but its doctrines are very difficult to practice continuously in the face of pain, sorrow, adversity, failure. It may be stated as a general axiom that the cheerfulness of a man varies inversely as the number of persons with whom he comes in contact. Likewise the problem of cheerful leadership becomes more involved as the number of different individuals over which responsibility is assumed increases, and the successful leader must adjust his disposition to deal with the thousand and one complex characters in an equally fair-minded manner. Each man in a group will have his individual problem in life to solve, his own outlook on things, his own particular environment, to say nothing of the very important traits of heredity. It is to understand and deal justly without show of impatience in each case that the leader must cultivate a cheerful demeanor.

Cheerfulness bespeaks a positive nature and is a virtue of the highest order. The man who can display a sunny disposition in the face of all the problems which fate unfolds before him, whether they be simple or complex, has conquered the human failing so often evident in weak characters, that of a surrender of hopes

and ambitions in the face of combinations of trying circumstances. Take for instance the case of the commanding officer of a company, regiment or division of men and suppose that some half dozen or more desert, rob, or perjure in spite of the earnest efforts of the leader to improve the conditions of his command, in spite of trust and faith placed in them. Is it a righteous principle or doctrine which abandons all trust, assumes the whole to be of the same caliber as the minority, and which refuses future consideration and interest? This is a common occurrence in a small organization with leadership which cannot see beyond the confines of petty suspicion at the finer and broader responsibilities of command. It is the easiest course to strike at the minority by punishing the majority when exasperated beyond the limit of self-control but it is not the fairest nor the most productive of results. Where there is such surrender of patience there can never be common understanding and sympathy between leader and subordinates necessary in a perfect organization. Washington could never have suspected the sincerity of his generals in the face of Arnold's treason or he would surely have courted disaster. The positive side of one's character must never succumb to the few negatives which are often cast in the way, otherwise leadership must inevitably fall to a state of petty subordination. The faith. the cheerfulness—for the two are analogous—of the Christ towards his people despite the trials and tribulations, faithlessness, slander, and torture preceding Calvary is the foundation of the Christianity which permeates the national life of every great country to-day. That cheerfulness, that positiveness of nature is the symbol of the Divine Leadership which led to a greater and better civilization.

Major-General Shanks has aptly stated that "Of all the valuable qualities which an officer can have, few of them are superior in importance to tact." Tact involves a first rate knowledge of human nature and is an essential in all classes of leadership. The ability to understand all phases of life as applied to individual cases, to act and speak accordingly with due appreciation of all the features involved is the sum and substance of tact. Tactfulness towards superiors and towards subordinates is the mark of a gentleman and a requisite of leadership. Nothing distinguished Washington in his dealings with men so much as his ready power of perceiving points of view and his gentlemanly ac-

tion in dealing with all circumstances. We find evidence of this fact in his letters to his generals and the statesmen, in his memoirs, and in his differences with members of the political cabal formed against him.

In concluding the subject of personality special stress should be laid on the subject of ambition—definite, legitimate ambition. The man at the head of an organization or group of men who has a clear conception of his goal, of his ultimate object, and who imparts this purpose to the entire body under him, creating a motive for employment based not alone on the contents of the weekly pay envelope, cannot fail to achieve success and take his men with him. "In union there is strength," says the proverb and in the united ambition of a collective assembly there is that "will to do" which spells accomplishment. The supremacy of France was the ambition of the greatest of French generals and it was the ambition of every troop in every army corps. No matter what the duty or what the goal may be, the aim of the leader must be imparted to every soul involved, it must be the slogan on every pair of lips and the light in every pair of eyes to carry the case to the extreme. Whether it be the record-building construction of a vessel on the ways or the winning of the regimental colors the ambition of the manager should be that of every riveter and mechanic; the ambition of the colonel that of every sergeant, corporal and private.

Ambition carries with it, independent of other virtues, a great lesson to a body of people in the way of examples. The leader who exhibits practically, to a group of men that he commands, his ambition to learn more and more about the phases of their labor, who goes into shop and foundry, office and factory, to learn the rudiments of the trades he supervises; who by application to his studies reaches that point where he can ably instruct; who can assimilate all of his knowledge in the practical intelligent command of every little detail; and then who on top of that can state or by action exemplify the fact that he wishes to learn still more and is really only at the bottom of the ladder of knowledge—that man cannot fail to be an inspiration of the highest order to those who come under his sphere of influence.

The subject of loyalty is a very broad one and yet in its every sense it is essential to good character. It embodies all of that far-seeing ambition and faith displayed in a strong personality.

Loyalty to one's God, one's country, and one's family are what we all expect but the loyalty to personal authority which is so often necessary in the military services as well as in the business and technical professions of civil life is oft times difficult. Personalities so many times enter into the line of duty demanded in the army and navy or in fact any organization that the main object in view to demand one's loyalty is often lost sight of. How often do we find a soldier or a sailor refusing to keep clean and tidy and offering a general appearance of neglect to spite a superior officer for whom he has a personal dislike. The mistaken idea involved is that his loyalty is based entirely upon a conception of the personality rather than the ideals or the interests of the organization which he serves. The man harms himself alone. By reason of his momentary slackness and disinterestedness he places himself on the level of those unfit to command because of this subordination of the ideal to the material, principle to personality, loyalty to the bigger and better things to those of self. He who follows the false colors of personalities will forever remain a subordinate. Commander Schofield, U. S. N., has stated, "Loyalty means the continued consciousness of membership, of partnership in the whole. It means that the desire for the good of the whole must predominate." The following is what the army demands of commanding officers reporting upon the fitness of subordinate officers: "Proper authority having decided on the methods and procedure to accomplish a certain desirable end, state whether he impresses you as being an officer who will co-operate energetically and loyally in accomplishing this end *regardless of his personal views in the matter.*"

What greater examples of unfailing loyalty and fidelity to a cause than that of our own Washington, the first to rise above colonial prejudices and become national; Bismarck who looked beyond the personalities of the Hohenzollerns at the formation of a great German Empire; and the extreme case of unflinching devotion to duty displayed at Balaclava in the Crimean War? They are all instances of loyalty to a principle or to a cause, an abandonment of the petty prejudices of personalities which tend to tear down the framework of character.

Following upon a consideration of loyalty and in conjunction therewith is that of subordination. It has been said that a poor subordinate will never make a successful leader. Napoleon in

some of his letters disagreed with this theory and from the course of his life we might deduce the fact that this very lack of appreciation of the qualities of subordination eventually caused his failure. He seemed to underestimate even the superiority of the elements and of nature, for after such overwhelming victories as those of Jena and Austerlitz, it seems that Bonaparte failed to concede the impossibility of any task. Therein lay his lack of appreciation of the qualities of subordination.

It would be rather harsh to accuse him of attempting to rival the Gods, but it is fair to say that he certainly never realized the superiority of any combination of earthly circumstances with which he must concede an impossibility to cope.

Furthermore, it is reasonable to state that a man who as a junior cannot subordinate his own views to the opinions of higher authority and devote himself loyally to a cause can never demand such action on the part of his inferiors in rank and experience should he be placed in a position of command. Leadership would surely be an hypocrisy which allows the commanding personage the exactions of discipline and obedience, the practice of which he never himself exercised.

The majority of the premier qualities which constitute the character of the leader have been stated but there are yet two others which are outstanding features of the will and privilege to command. The exercise of initiative and the wilful assumption of responsibility are characteristics which distinguish probably more than any other between the leader and the follower, between the broad man and the narrow-minded victim of environment, between the success of accomplishment and the casual indifference of mere humdrum existence.

The emergencies which occur at different moments in one's career are usually direct tests of a man's initiative. Admiral Stirling calls it "trained initiative" and he means the preparation and moulding of one's point of view in younger years to assume the personal control of unforeseen situations and to take full responsibility for the results of any action taken—the trained mind to take command in emergencies.

Bismarck had decided ideas on this subject, for in his memoirs, speaking of the particular type of diplomatist then dominant in Prussian affairs of state, he says, "Another feature was the disinclination to accept personal responsibility when not covered by

unmistakable instructions just as was the case in the military service in 1806, in the old school of the Frederickian period."

What was the outstanding feature of the success of Farragut at Mobile Bay and of Dewey at Manila except that both officers exercised the extreme of initiative in forcing a hazardous entrance to a well fortified harbor in the face of the most difficult circumstances with but few instructions to guide them, and furthermore that they willingly assumed full responsibility for all consequences? The measure of their successes as well as their striking examples of superior leadership and the interpretation of its principles are what place them foremost in the annals of Aemircan naval history.

English naval history affords many similar illustrations. Mahan points out in several of his works how the rigid wording of the Fighting Instructions of the 18th century had very nearly gagged and bound the flag and commanding officers from the exercise of any discretion or initiative in tactical formation, or at least they had thoroughly restricted the activities of those officers of higher rank who might by weakness of character or constrained point of view be addicted to extreme short-sightedness in obeying the letter rather than the spirit of the law. Matthews at Toulon in 1744 and Byng at Minorca in 1756 presented the most flagrant cases of disaster, resulting in the dismissal of the former and the execution of the latter. Following the tactical instructions word for word in two situations never before encountered and hence never allowed for in the phraseology of the rules, they both brought the sting of defeat to two of His Majesty's squadrons. England also furnishes two of the greatest examples of the willingness to accept personal responsibility and to initiate action in the figures of Nelson and Rodney. Nelson at the Nile, Nelson at Copenhagen, and Nelson at Trafalgar under three entirely different conditions demonstrates the special significance of initiative in the makeup of the leader. Likewise Rodney on the West Indian station without instructions from the Admiralty and in the face of an approaching French squadron abandoned the protection of the Windward Islands in the more important task of preventing the enemy acquisition of Jamaica.

"Stonewall" Jackson is spoken of in the most glowing terms on this same subject, "He accepted responsibility with the same equanimity that he faced the bullets of the enemy."

How often is heard the expression, "Well, that's not my job." It's the fireman's job to put out the fire destroying a building but that doesn't prevent the man in the office from throwing a bucket of water on the blazing curtain which started the fire. It's the life-guard's job to rescue the drowning person but that doesn't relieve the big athletic fellow on the dock close by from rendering all possible assistance. A refusal to accept responsibility in one case may result in the dwarfing of one's point of view such that when the opportunity comes to meet a situation or to rise the man may not be equal to it. The belief in the restriction to one's own special branch of work with neither knowledge nor interest in any other will result in the sequel of forever narrowing a man to that one line of operations, and he will never be able to rise above that level on which he has placed himself. The mere pipefitter can never be the head of a plumbing concern; the special lathe mechanic who can run but one type of lathe will never be a shop foreman or plant manager; the fireman who is content with shovelling coal out of a bunker will never be an engineer; the seaman or deckhand who is satisfied with slapping paint on a ship's side will never have a command of his own. There should always be that constant desire and exertion to learn more; more about one's own particular line of work and more about the duties and responsibilities of the people above so that when the opportunity arrives there will be no hesitancy, no doubt as to qualifications for advancement. The keynote may be found in that one word—initiative—expressed as a two-fold proposition: "(1) the power to make starts, and (2) to act upon one's own responsibility in order to help the cause of the chief." The latter, a quotation, might better read "in order to help the chief cause."

The last is a consideration of moral qualities of the highest order as a basic element of character. The true leader must be a personification of the maxim "Do as I do" rather than the distortion of "Do as I say do." The force of example is the most impressive means by which the loyalty and obedience of a group of followers may be obtained. Disciplining a man for drunkenness the morning after one's own night out, or in the face of recent carousals known to that subordinate can have but little effect in changing him for the better. The foreman can censure under cover of the company's or firm's rules, the mili-

tary officer may punish by virtue of the regulations, but neither of them has accomplished anything nor demonstrated his own superior qualities of leadership by force of his personal example.

An examination of history will reveal the truth of these statements. Practically every great leader of the military, political or social activities of the past has acquired such leadership as much by the force of example as by any other means. Cleanness of morals may have been forsaken after rise to power, resulting thereby in the downfall of the leadership, but the original success was gained only by the force of example of character and integrity.

Here is concluded a detailed discussion of the factors which constitute the qualifications for successful leadership and before leaving the subject with a few concluding remarks a general summary of the points taken up to stress the two main requisites of knowledge and character would be in order. Knowledge requires an understanding of principles of one's profession and a never-ceasing endeavor to acquire further information of particular advantage to the line of work assumed; a knowledge of all things that will benefit an aspirant to success and the leadership of men. Character demands first of all good, wholesome, everyday common sense which in itself spells personality. The latter includes the elements of clearness of thought, quickness of action, sound judgment, cheerfulness, tact, forcefulness of speech and appearance, neatness, self-evident ambition, faith in humanity, keen insight into human affairs, the appreciation of individual points of view, and adaptability. Lastly, there are the prime requisites of loyalty, the will to initiate and assume responsibility, the necessary quality of subordination to ideals rather than personalities, and the belief in and practice of the force of example.

Suffice it to say that the average human being cannot possess all of these but, as has been pointed out before, the measure of one's worth lies in the percentage of accomplishment. The eternal goal of perfection is set so out of human reach that it may seem well nigh impossible of attainment, but it is the calculation of the effort which judges men, the ratio of results obtained to those capable of being obtained. Leadership is success for it involves the only two elements upon which all of the other complexities of life are based.

In summarizing the characteristics of that great leader of a new-born Commonwealth who illustrated so clearly and convincingly what the observance of the natural rules for pursuing a successful career of leadership may produce, Henry Cabot Lodge has stated in one paragraph the principles elucidated above. He says, "I see in Washington a great soldier who fought a trying war to a successful end impossible without him; a great statesman who did more than all other men to lay the foundations of a republic which has endured in prosperity for more than a century. I find in him a marvellous judgment which was never at fault, a penetrating vision which beheld the future of America when it was dim to other eyes, a great intellectual force, a will of iron, an unyielding grasp of facts and an unequalled strength of patriotic purpose. I see in him too a pure and high minded gentleman of dauntless courage and stainless honor, simple and stately manner, kind and generous of heart." A great tribute to the greatest of American leaders, and a fitting model to take as the exponent of successful leadership.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

LOYALTY[1]

By REAR ADMIRAL R. H. JACKSON, U. S. Navy

The theme which I have chosen for my address is *loyalty*. I will define loyalty and show you that it is the foundation of all the virtues and that in some form it is of constant application throughout our career. That here to-day I am employing it in my address to you—a loyalty to this institution.

Loyalty is ordinarily defined as fidelity to superior, to duty, etc. A synonym of fidelity which is in turn derived from fides, faith.

But loyalty connotes feeling or sentiment, strong or enthusiastic, accompanying a sense of allegiance. It begets action; it is faith with works.

Royce tells us:

> Loyalty is indeed an old word and a precious one and the general idea of loyalty is still far older than the word, and immeasurably more precious. For everybody has heard of loyalty; most prize it; but few perceive in its inmost spirit what it really is—the heart of all the virtues, the central duty among all the duties.
>
> In loyalty is the fulfillment of the whole moral law.
>
> Justice, charity, wisdom, spirituality, are all defined in the terms of enlightened loyalty. For loyalty is the willing and practical and thoroughgoing devotion of a person to a cause.
>
> Nor is loyalty mere emotion. Adoration and affection may go with loyalty; but they can never alone constitute loyalty.
>
> Furthermore the devotion of the loyal man involves a sort of restraint or submission of his natural desire to the cause.
>
> Loyalty without self-control is impossible.
>
> The loyal man serves. That is he does not merely follow his own impulses.

[1] An address delivered at the graduation of the Naval War College, class of December, 1919. Naval War College, Newport, R. I., November 20, 1920.

He looks to his cause for his guidance. This cause tells him what to do and how to do it.

His devotion furthermore is entire. His is ready to live or to die as the cause directs.

In this cause is your life, your will, your opportunity, your fulfillment.

Furthermore, loyalty is contagious. It affects not only you, the fellow-servant of your own special cause, but also those who know of this act.

Loyalty is a good that spreads. Live it and you thereby cultivate it in other men.

Now you may say this is a fine philosophy; but where is the application to the service? I would not be a true exponent of the applicatory system if I did not endeavor to point out that loyalty is to be practiced daily.

At this moment I am applying it to this institution, the War College.

The previous valedictorians have shown their loyalty to the college in their addresses.

One gave a sketch of the college, its growth, its excellent work and its benefit to the service and went forth as a missionary urging that more officers be sent to profit by its course.

Another partly in his own words, and parly in those of Kipling in prose and in poetry testified to the benefits that he and all of his class has received, and commended the soundness of the doctrine.

To the testimony of these witnesses the graduation class echoes a loud *aye, aye;* most heartily responds *aye, aye.*

The college doctrine brings out the need for loyalty to the leader, and loyalty to the plan.

My theme is to emphasize the need of an all-embracing loyalty to the service and the flag—a loyalty to loyalty.

Now this does not always exist.

We know officers who are not loyal to the Naval Academy, their foster-mother. Yet that institution made them in part what they are. They thus become disloyal to themselves.

On board ship the officers and crew are generally most loyal to the ship and to the captain. Woe betide the ship if this be not so. If they be not loyal, they themselves are to blame, and their character is adversely affected by this lack of loyalty.

But in how many ships do we find any loyalty to the division or to the fleet as a whole?

The most successful division commander that I have ever known had on the after turret of the flagship the words "For the Fleet." Every officer and every man in that division was better for that motto.

Let us turn to the "Articles for the Government of the United States Navy" which is our military guide, we might say our Bible, and see what position loyalty holds.

The commanders of all fleets, squadrons and vessels belonging to the navy shall show in themselves a good example of VIRTUE, HONOR, PATRIOTISM and SUBORDINATION.

Now *patriotism* is *loyalty* to the country.

Subordination is *loyalty* to authority, to the commander and to his plan. Insubordination is disloyalty.

Virtue, which here means valor or courage, implies a willingness to fight for one's beliefs and principles. Timidity or cowardice implies a willingness to abandon them, a disloyalty to them.

Honor is a nice sense of what is *just, right* and *true.*

Honor is really loyalty to self.

Thus we see that the first two principles *virtue* and *honor* are founded on *loyalty* and the latter two *patriotism* and *subordination* are really forms of loyalty itself.

So that our navy Bible may be said to be founded on these three, *virtue, honor* and *loyalty,* but the greatest of these is loyalty.

It is interesting to find that in the Oriental mind the virtues of military character are but two: Filial piety and loyalty. Character is likened unto a cart of which the two wheels are their virtues. Without these wheels the cart is a wreck.

So that even in the Oriental mind, which so often looks at things topsy turvy, loyalty is also the base of all character, military and moral.

Now what are some of the enemies of loyalty?

They are well known and should be guarded against constantly; idle gossip, loose criticism, a willingness to believe the worse; snap judgment without waiting for facts—these are disloyalty to the cause, whether it be embodied in a personality or an ideal.

Lord Jervis, one of the strongest characters in naval history, who brought the British fleet to a high state of discipline at most

turbulent period in its history, voices a warning concerning the danger that lurks in this practice in the wardroom.

> Discipline begins in the ward-room. I dread not the seaman. It is the indiscreet conversation of the officers and their presumptuous discussion of the orders received that produce all our ills.

The remedy is simple.

Take no part in such practices, and so far as possible suppress them.

The Oriental idea is illustrated in the group of the three monkeys that with hands over mouth, eyes and ears, respectively; speak no evil, see no evil, hear no evil.

But this is rather a negative attitude, in keeping with the Oriental mind.

We find in St. Paul's Epistle to the Philippians a much more vigorous, a western remedy. Founded, too, on sound psychology:

> Whatsoever things are true, whatsoever things are honorable, whatsoever things are just, whatsoever things are pure, whatsoever things are lovely, whatsoever things are of good report; if there be any virtue, if there be any praise, think on these things.

Here is no mere closing the senses to the evil reports which may all be lies; but an active searching out of the good. "If there be any virtue, if there be any praise think on these things."

But there is a narrow, restricted form of loyalty, that is not a true loyalty, not a "loyalty to loyalty," and that is partisanship.

Against that we must be on our guard. For partisanship is a blind devotion to person or party, it engenders rivalry, jealousy and bitterness. The person no longer feels lifted out of himself and dedicated to a sacred cause. But secretly feels he is responding to the baser motives within, desire for unlawful exercise of power, lust for revenge, unfair advantage. Yet this pseudo-loyalty, this tendency to form cliques, is all too frequent as military history can attest.

The remedy is to choose for our loyalty the ideal, not the personal, not the admiral alone, but the fleet; not the navy alone, but the flag.

I have already quoted from St. Paul, a great leader and the personification of loyalty.

I quote once more from his valedictory written at Rome shortly before his death to Timothy, his beloved fellow-worker in the cause.

> For I am already being offered (as a sacrifice) and the time of my departure is at hand; I have fought a good fight; I have finished my course; I have kept the faith.

Here is the message and the wish that we of the graduating class bear to you and to the service, and which we take away in our own heart from this institution.

When the time comes, as come it must, when we shall cease from public service to our country and to our flag, whether it be merely to terminate our active naval careers, and seek repose among family and friends, or whether it be to take our last long cruise to that undiscovered country from whose bourne no traveller returns, may we one and all be able to say freely and conscientiously and gladly:

> I have fought a good fight; I have finished my cruise; I have kept the faith; I have been loyal to LOYALTY.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ELASTIC STRENGTH OF RADIALLY EXPANDED GUNS

By Lieut. Commander W. H. P. Blandy, U. S. Navy

By a "radially expanded" gun is meant a gun which has been subjected to the process of *autofrettage*, or, as it is officially designated in our service, radial expansion. It would seem that we might have adopted a more expressive name by translating the French term literally into "self-hooping." Then our gun would have been "self-hooped." The name, however, makes little difference. What we are interested in is the method, together with its effects upon the gun. It may be said here that although the process is applicable to the construction of guns having more than one layer, the present article deals with one-piece guns only.

For the benefit of those who are not familiar with the process, and who may have missed the article, "Gun Construction by Radial Expansion," by Commodore S. J. Brown (Math. C.), U. S. Navy, published in the Proceedings for December, 1920, a brief explanation may be worth while. We expand the gun by internal hydraulic pressure, until practically all of the metal has been stressed beyond its elastic limit; then we release the pressure. The metal at the bore, having been the first to yield, plastically, is deformed the most, and if let alone would keep all of its "set." But the outer layers have received very little plastic deformation; their distension is nearly all elastic. Hence, if unobstructed by the more deformed metal nearer the bore, they would return almost entirely to their original dimensions. The result of this conflict of tendencies is a compromise. The inner layers take on a tangential compression, while the outer layers retain part of their tangential tension. The greatest compression is at the bore; the greatest tension at the outer surface; and somewhere near the

middle of the wall there is metal free from tangential stress. The gun is literally "self-hooped."

So much for the definition. Now let us investigate the stresses to which the metal is subjected during this process. In the first place, there is absolutely no longitudinal stress applied, for an arbor running through the bore carries at its ends the packings which effect the hydraulic seal. The endwise hydraulic pressure is thus entirely balanced by the tension which it produces in this arbor. In the gun itself, then, we have only a radial compression and a tangential tension. Each of these, so long as the gun is strained only elastically, has its greatest value at the bore. The metal here is therefore the first to be carried past its elastic limit, and the stresses causing it to pass this limit are therefore a pressure and a tension, acting at right angles to each other.

The first theory which we will consider, purporting to explain the effect of these combined stresses, is that of Captain Charles Duguet, French artillery, as expounded in his "Limite d'Elasticité et Résistance à la Rupture," published in 1885. As Commodore Brown mentions in his article, previously referred to, Duguet put forth the argument that the plastic deformation of metals was an entirely different phenomenon from the mere "intermolecular displacement" occurring before the elastic limit was reached. He said it was a slipping of the grains upon one another, or—no matter what the applied stress might be—a *shear*. We know to-day, from microscopic examination of metals during their deformation, that such slipping does take place, even inside the grains, along cleavage planes determined by the system of crystallization.

By Duguet's theory, a compressive stress along the axis of a bar would cause failure by shear along conical surfaces or inclined planes making angles of about 40° with the axis—not 45°, as would appear to be the case at first thought, because he took into account an "internal friction of shear." This friction, he said, was increased by the pressure brought to bear upon the shear-plane by the normal component N of the pressure P. (See Fig. 1.) On the other hand, it was decreased if the axial stress were tension, for in this case the normal component would also be a tensile stress; and shear then occurred on planes or cones making angles of 50° with the axis. It is of interest that the coefficient which Duguet used with the normal component is approximately the same as the coefficient used to-day for static friction between dry metal surfaces.

Proceeding upon this theory, Duguet arrived at the following relations between the elastic limit of tension (E_t), the elastic limit of compression (E_c), and the elastic limit of simple shear (G):

$$0.60E_t = 0.42E_c = G.$$

Hence, $$E_c = 1.43E_t.$$

A metal subjected, then, to a tension T and a pressure P acting simultaneously at right angles would fail elastically when:

$$0.60T + 0.42P = G.$$

Or, $$T + 0.70P = E_t.$$

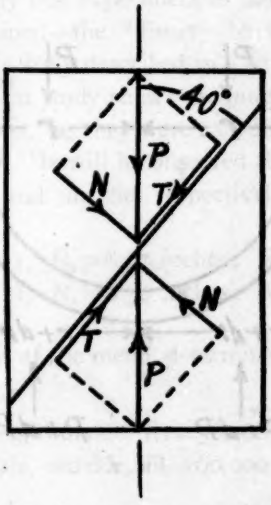


FIG. 1.

There are two other theories for the failure of metals under combined stresses. One is the "elastic limit of strain" theory, which says that a metal subjected to two or more stresses will fail only when the greatest strain in any direction equals the elastic limit of strain shown by test under simple stress—tension or compression, acting singly. Using $\frac{1}{3}$ for "Poisson's ratio," failure would occur when:

$$T + 0.33P = E_t,$$

T being greater than P. If P is greater than T the metal fails when:

$$P + 0.33T = E_c.$$

The third theory is the same as Duguet's, except that it disregards the changes in the internal friction of shear caused by the normal components of the applied stresses. This theory is entertained to-day by M. Pierre Malaval, Ingénieur en Chef d'Artillerie Navale; although in 1912 he published an article in the "Mémorial d'Artillerie Navale," in which he supported the "elastic limit of strain" principle. His later belief would make E_t equal to E_c; and failure under the two stresses at right angles would take place when:

$$T+P=E_c=E_t.$$

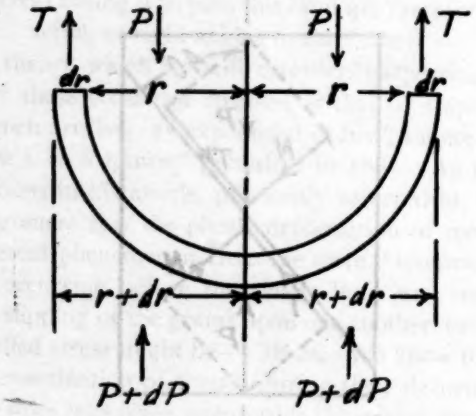


FIG. 2.

Duguet seems to have struck a pretty fair mean between the other two assumptions. Following his work, we find that he combined his equation:

$$T+0.70P=E_t$$

with the differential equation:

$$rdP+Pdr+Tdr=0 \text{ (see Fig. 2)},$$

and obtained the following formula for that pressure (P_0) in the bore (radius R_0) which will just bring the outer surface (radius R_1) to the elastic limit of tension:

$$P_0=3.33E_t\left[\left(\frac{R_1}{R_0}\right)^{0.3}-1.\right]$$

This formula does not take into account the increase in the elastic limit of the metal itself, due to its being "cold-worked" beyond this limit. Duguet realized that there was such an increase, but claimed that unless the expanding process was overdone, the deformations would be so slight, even at the bore, as to permit disregarding the effect of this cold-working upon the elastic limit. He admitted, however, that this omission would make the value of P_0 given by his formula slightly low.

Now let us see how well Duguet's formula does agree with practice. There is only one experiment at hand from which complete data can be obtained—the "Emery Process 4-Inch Gun Test." This experiment is fully described in Commodore Brown's article. Fig. 3 of the present study shows the inner and outer radii at four points (or "stations," as they were called in the report of the test) on the Emery gun. It will be observed that at Stations I and II, near the breech and muzzle, respectively, the radii of the gun were:

Station I, $R_1 = 8.17$ inches; $R_0 = 2.37$ inches.
Station II, $R_1 = 6.32$ inches; $R_0 = 1.78$ inches.

The elastic limit of the metal, determined from tensile test specimens, was:

At breech, outside, $E_t = 56{,}000$ lbs. per sq. in.
At muzzle, outside, $E_t = 60{,}000$ lbs. per sq. in.

Using 30,000,000 as the modulus of elasticity, the "extension of outside diameter" corresponding to the arrival of the outside metal at its elastic limit, in each case, was:

$$\text{Station I, } \delta D_1 = \frac{56{,}000 \times 16.34}{30{,}000{,}000} = 0.0305 \text{ in.}$$

$$\text{Station II, } \delta D_1 = \frac{60{,}000 \times 12.64}{30{,}000{,}000} = 0.0253 \text{ in.}$$

On the first straining, the internal pressures producing the above strains were, as shown by Figs. 4 and 7:

Station I, actual P_0 was 86,000 lbs. per sq. in.
Station II, actual P_0 was 90,000 lbs. per sq. in.

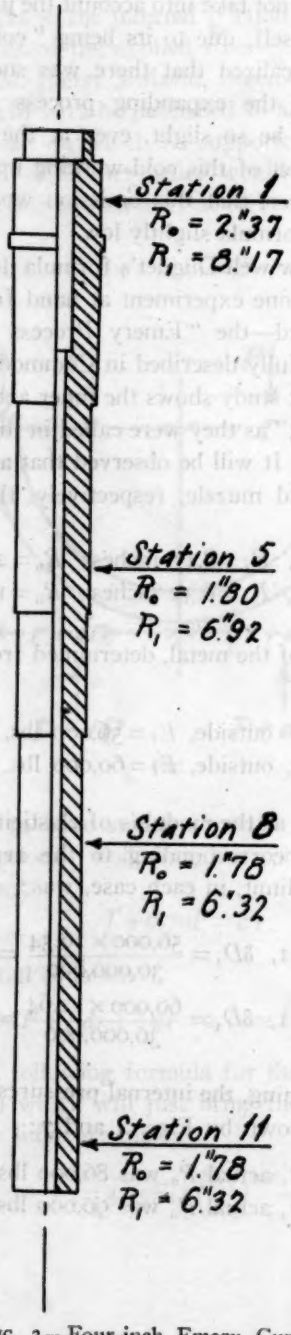


FIG. 3.—Four-inch Emery Gun.

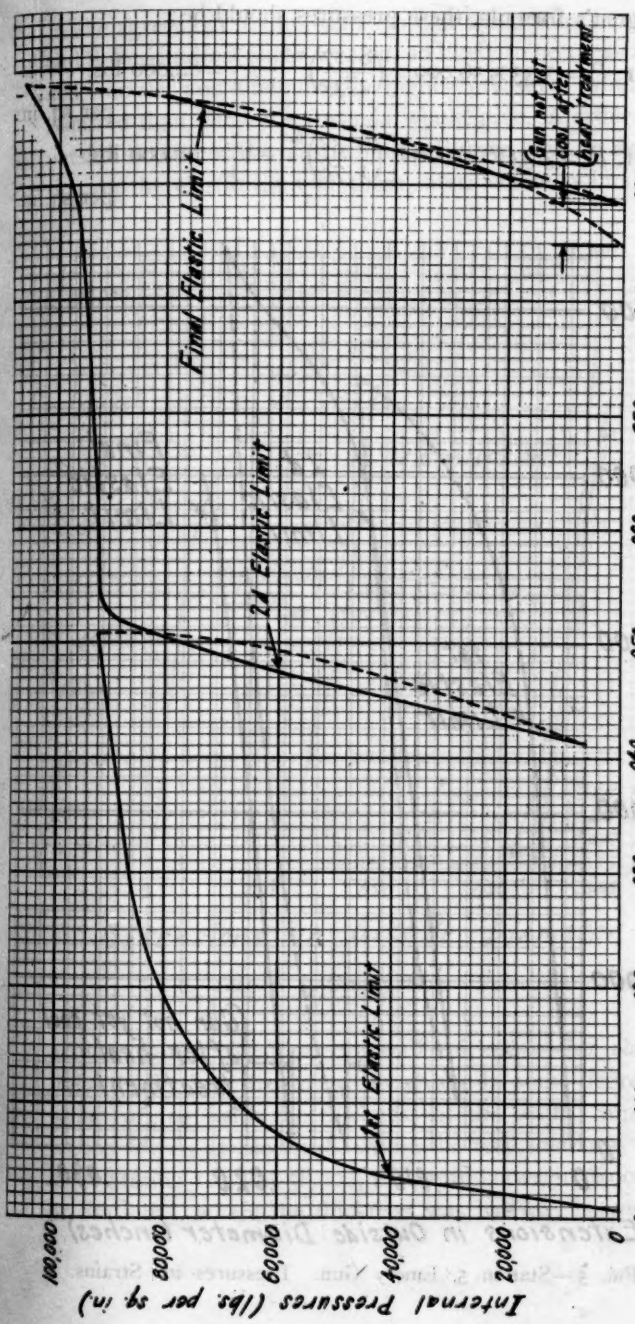


FIG. 4.—Station 1, Emery Gun. Pressures *vs.* Strains.

By Duguet's formula, these pressures should be:

Station 1, $P_0 = 3.33 \times 56{,}000 \left[\left(\frac{8.17}{2.37}\right)^{0.3} - 1\right] = 84{,}000$ lbs. per sq. in.

Station 11, $P_0 = 3.33 \times 60{,}000 \left[\left(\frac{6.32}{1.78}\right)^{0.3} - 1\right] = 92{,}000$ lbs. per sq. in.

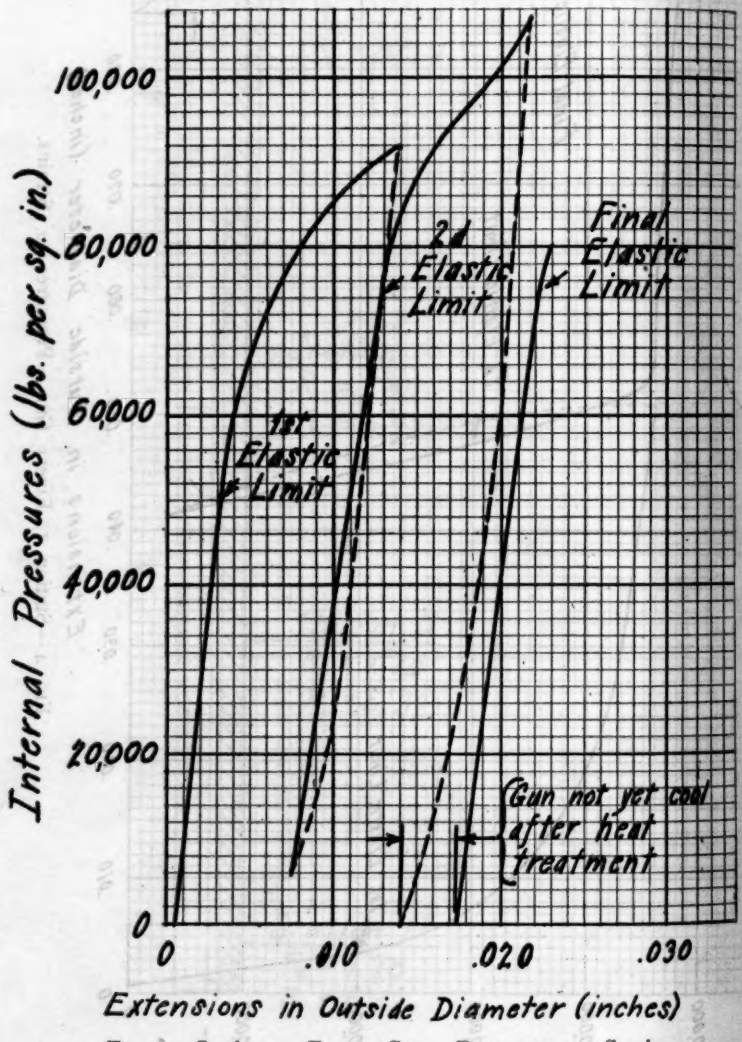


FIG. 5.—Station 5, Emery Gun. Pressures *vs.* Strains.

The agreement is thus very close at these points. At Stations 5 and 8, longitudinal shear was not so likely to occur as at the breech and muzzle, and undoubtedly higher pressures would have been required than Duguet's formula would give, in order to bring the outside surface to the elastic limit. But we have no exact information on the elastic limit at these intermediate points. We might

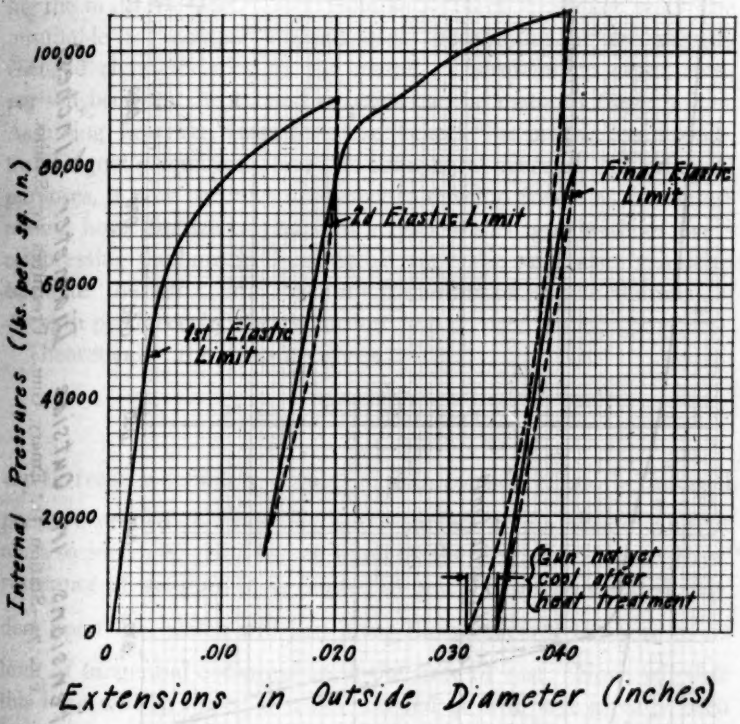


FIG. 6.—Station 8, Emery Gun. Pressures *vs.* Strains.

assume values based on the wall thickness—for elastic strength imparted by heat treatment does vary in some degree, within the same forging, with the thickness of the wall. Suppose we take 60,000 for E_t at Station 8, where the wall thickness was the same as at Station 11; and 58,000, the mean between 56,000 and 60,000, at Station 5, where the thickness was halfway between the values

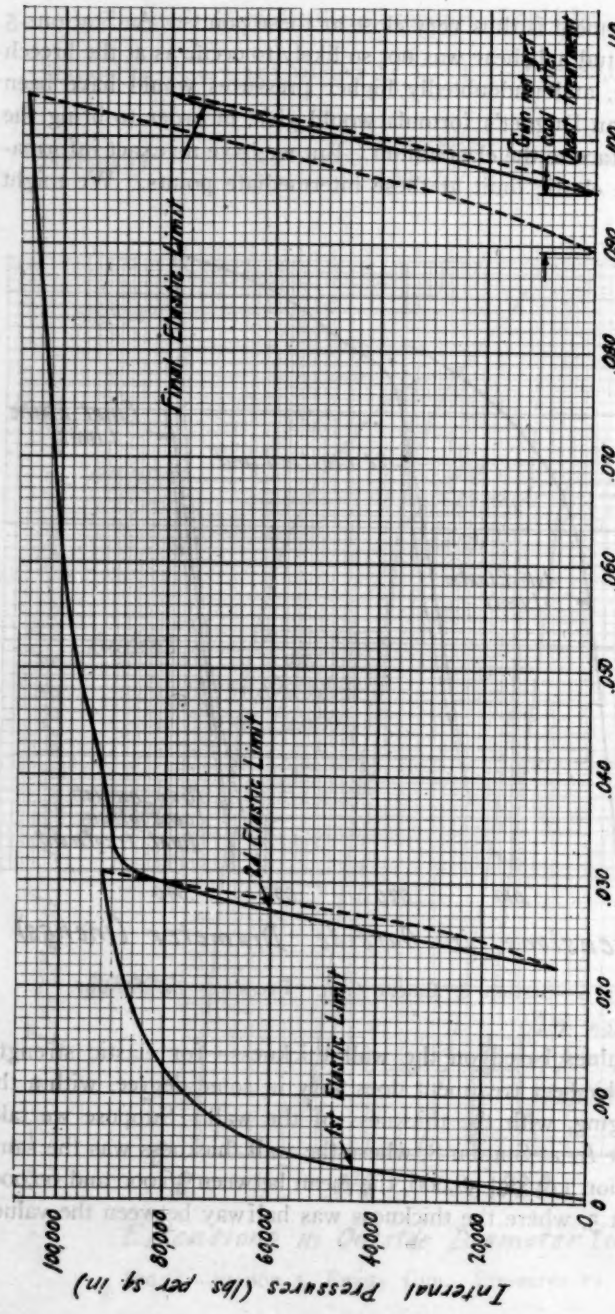


FIG. 7.—Station 11, Emery Gun. Pressures *vs.* Strains.

at Stations I and II. With these estimates for the elastic limit, the corresponding extensions in outer diameter would be:

$$\text{Station 5,}\quad \delta D_1 = \frac{58{,}000 \times 13.84}{30{,}000{,}000} = 0.0268 \text{ in.}$$

$$\text{Station 8,}\quad \delta D_1 = \frac{60{,}000 \times 12.64}{30{,}000{,}000} = 0.0253 \text{ in.}$$

Figs. 6 and 7 show that these extensions were not reached during the first straining. Data from subsequent strainings would be unsuitable for comparison purposes, on account of the slightly changed characteristics of the metal. Therefore no exact comparison between theory and practice can be made at these points. Assuming, however, from the close "check" at muzzle and breech, that Duguet's equation for P_0 is sufficiently accurate for practical purposes, it now becomes necessary to develop formulas for determining how far we can expand a thick-walled gun without overcompressing the bore in the state of rest. We must also be able to calculate the effect of machining operations, upon the elastic strength produced by the expansion.

Theoretically, the pressure given by

$$P_0 = 3.33 E_t \left[\left(\frac{R_1}{R_0} \right)^{.3} - 1 \right]$$

can increase indefinitely with $\frac{R_1}{R_0}$; and, considered as the internal pressure needed to bring the outer surface to its elastic limit, it must so increase. But looked upon as the new elastic strength or resistance of the gun, P_0 is limited in practice to that value, dependent upon $\frac{R_1}{R_0}$, which will just bring the surface of the bore to its limit of tangential compression in the state of rest. Now, whether this limit will be raised if it is exceeded or will have already been lowered by the previous cold-working in tangential *tension*, we do not know. Therefore our safest course will be to assume, with Duguet, that the plastic deformations have been so slight, even at the bore, that the elastic limit of compression, as well as that of tension, has been neither raised nor lowered.

To determine, then, the limit of $\frac{R_1}{R_0}$ for which we can afford to expand the gun to the end of the "semi-elastic period," we must obtain an expression for the tangential stress remaining at the

bore after the expanding pressure P_0 has been relieved, and equate this expression to E_c, the elastic limit of compression.

After expansion, even during the return to the state of rest, the gun is considered to be a simple elastic tube. Therefore we may apply the principle of "superposition of stresses" which is used in calculations on built-up guns. In other words, we may add algebraically, to the stresses already existing at any point, any new stresses caused at that point by a new pressure, applied either inside or outside the tube.

The equation universally accepted as showing the relation between tangential tension and radial compression existing simultaneously at any radius r in the wall of a hollow elastic cylinder, is:

$$t_r = p_r \frac{R_1^2+r^2}{R_1^2-r^2}.$$

At the bore this becomes:

$$t_0 = p_0 \frac{R_1^2+R_0^2}{R_1^2-R_0^2}.$$

Now let T_0 = tangential tension at R_0 under expanding pressure P_0, and t_0 = tangential tension at R_0 due to adding a new pressure, $p_0 = -P_0$ (*i. e.*, due to relieving P_0), considering the expanded gun now as a simple elastic tube.

Let $T_0 = T_0 + t_0$ = tangential tension, state of rest. If negative, as they will be, t_0 and $\overline{T}_0$ will be compressions.

By Duguet's theory,

$$T_0 = E_t - 0.7P_0 = E_t - 0.7\left[3.33E_t\left\{\left(\frac{R_1}{R_0}\right)^{0.3}-1\right\}\right].$$

Whereas,

$$t_0 = p_0\frac{R_1^2+R_0^2}{R_1^2-R_0^2} = -P_0\frac{R_1^2+R_0^2}{R_1^2-R_0^2} = -3.33E_t\left(\frac{R_1^2+R_0^2}{R_1^2-R_0^2}\right)\left\{\left(\frac{R_1}{R_0}\right)^{0.3}-1\right\}.$$

Therefore,

$$\overline{T}_0 = E_t - 0.7\left[3.33E_t\left\{\left(\frac{R_1}{R_0}\right)^{0.3}-1\right\}\right] - 3.33E_t\left(\frac{R_1^2+R_0^2}{R_1^2-R_0^2}\right)\left\{\left(\frac{R_1}{R_0}\right)^{0.3}-1\right\} = E_c = -1.43E_t$$

Or,

$$1-3.33\left[\left(\frac{R_1}{R_0}\right)^{0.3}-1\right]\left[0.7+\frac{R_1^2+R_0^2}{R_1^2-R_0^2}\right] = -1.43$$

$$\left[\left(\frac{R_1}{R_0}\right)^{0.3}-1\right]\left[0.7+\frac{\left(\frac{R_1}{R_0}\right)^2+1}{\left(\frac{R_1}{R_0}\right)^2-1}\right] = 0.728.$$

Solved graphically, the above equation gives $\frac{R_1}{R_0}=2.84$. A gun having this ratio of outer and inner radii will have to be subjected to an internal pressure equal to:

$$P_0=3.33E_t[(2.84)^{0.3}-1]=1.22E_t$$

in order to bring the outer surface to its elastic limit; and this P_0 will also be, thereafter, the elastic strength of the gun, except as modified by "finish machining." To take a concrete example, if the tensile elastic limit of the steel were 60,000 lbs. per sq. in., such a gun after expansion would have an elastic resistance of 73,000 lbs. per sq. in. In the state of rest, the surface of the bore would be under a tangential compression stress equal to $1.43\times 60{,}000=86{,}000$ lbs. per sq. in., which, by the Duguet theory, would be the absolute compressive elastic limit of this metal. In the state of action, the entire mass of the gun would be stressed just to its elastic limit, provided the pressure were 73,000 lbs. per sq. in.

Such a gun would certainly be strong enough to resist any powder pressure employed to-day. It might possibly be so light, however, as to throw too much load on the recoil mechanism, or be too "whippy." If, because of such considerations, or for any other reason, it is necessary to have a wall-thickness greater than $1.84R_0$, we cannot expand the gun until the outside surface reaches the elastic limit without incurring the danger of failure by "fatigue of the metal" at the bore. Another consequence of over-expanding a thick-walled gun is that the metal may be enabled by its own inertia to withstand the overcompression at the bore, until the shock of the first few shots destroys this inertia, causes a collapse, and necessitates re-boring the gun. This unpleasant circumstance has been known to occur more than once, in France.

To avoid overcompression of the bore, there are two courses open to us. We may use an expanding pressure less than that called for by the formula, stopping our plastic deformations at some radius R_d less than R_1; or we may carry the metal at R_1 far enough *beyond* its elastic limit to lessen its "grip" on the inner layers when the pressure is released. The latter method requires, of course, a considerably higher expanding pressure than the former, while the additional strength is not at all needed. Hence we will treat in this study the first plan only.

To determine the limiting value of R_d, and the corresponding value of P_0, when $\frac{R_1}{R_0}$ exceeds 2.84, we consider the gun as being composed of two cylinders (Fig. 8), the inner having radii R_0 and R_d, and the outer, R_d and R_1. The metal within R_d has reached its elastic limit, while that beyond R_d is in the purely elastic stage. Thus we have at R_d a radial compression or pressure P_d and a tangential tension T_d such that

$$T_d+0.7P_d=E_t.$$

Hence our formula for P_0, which assumes no external pressure, will not be correct, even for the "inner cylinder."

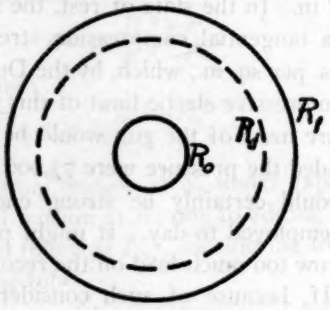


FIG. 8.

Going back to the two equations with which Duguet started,

$$rdP+Pdr+Tdr=0, \quad (1)$$

and

$$0.42P+0.60T=G, \quad (2)$$

we combine the two, integrate, and obtain:

$$\left(P+\frac{G}{0.18}\right)(r)^{0.3}=K$$

where K is the constant of integration. Making $P=P_0$ at $r=R_0$, and $P=P_d$ at $r=R_d$, and substituting $3.33E_t$ for $\frac{G}{0.18}$, we have:

$$(P+3.33E_t)(R_0)^{0.3}=K=(P_d+3.33E_t)(R_d)^{0.3}.$$

Therefore,

$$P_0=(P_d+3.33E_t)\left(\frac{R_d}{R_0}\right)^{0.3}-3.33E_t, \quad (3)$$

and

$$T_0=E_t-0.7P_0.$$

Now at R_d we also have:

$$T_d = P_d \frac{R_1^2 + R_d^2}{R_1^2 - R_d^2},$$

which, with

$$T_d + 0.7P_d = E_t$$

gives

$$P_d = \frac{E_t}{0.7 + \dfrac{R_1^2 + R_d^2}{R_1^2 - R_d^2}}. \tag{4}$$

Hence,

$$P_0 = E_t \left[\left(\frac{1}{0.7 + \dfrac{R_1^2 + R_d^2}{R_1^2 - R_d^2}} + 3.33 \right) \left(\frac{R_d}{R_0} \right)^{0.3} - 3.33 \right].$$

Now

$$\bar{T}_0 = T_0 + t_0 = E_t - 0.7P_0 - P_0 \frac{R_1^2 + R_0^2}{R_1^2 - R_0^2} = E_c = -1.43E_t.$$

Or,

$$P_0 \left(0.7 + \frac{R_1^2 + R_0^2}{R_1^2 - R_0^2} \right) = 2.43E_t$$

$$P_0 = \frac{2.43E_t}{0.7 + \dfrac{R_1^2 + R_0^2}{R_1^2 - R_0^2}}. \tag{5}$$

Therefore,

$$\frac{2.43E_t}{0.7 + \dfrac{R_1^2 + R_0^2}{R_1^2 - R_0^2}} = E_t \left[\left(\frac{1}{0.7 + \dfrac{R_1^2 + R_d^2}{R_1^2 - R_d^2}} + 3.33 \right) \left(\frac{R_d}{R_0} \right)^{0.3} - 3.33 \right].$$

This reduces to:

$$\frac{\left(\dfrac{R_d}{R_0} \right)^{0.3}}{1.7 \left(\dfrac{R_1}{R_0} \right)^2 + 0.3 \left(\dfrac{R_d}{R_0} \right)^2} - \frac{1.214 - 0.214 \left(\dfrac{R_0}{R_1} \right)^2}{1.7 \left(\dfrac{R_1}{R_0} \right)^2 + 0.3} = 0.$$

The above equation can be plotted as a curve having as abscissæ various values of $\frac{R_1}{R_0}$ and as ordinates the corresponding values of $\frac{R_d}{R_0}$, so that whenever $\frac{R_1}{R_0}$ exceeds 2.84, the proper value for R_d may be found from the curve (see Fig. 9). Then, knowing E_t, R_1, R_0 and R_d, we may find P_d and then P_0, from formulas (4) and (3), respectively. P_0 could be obtained more easily, of course, from formula (5), but, as will be shown later, it is necessary to

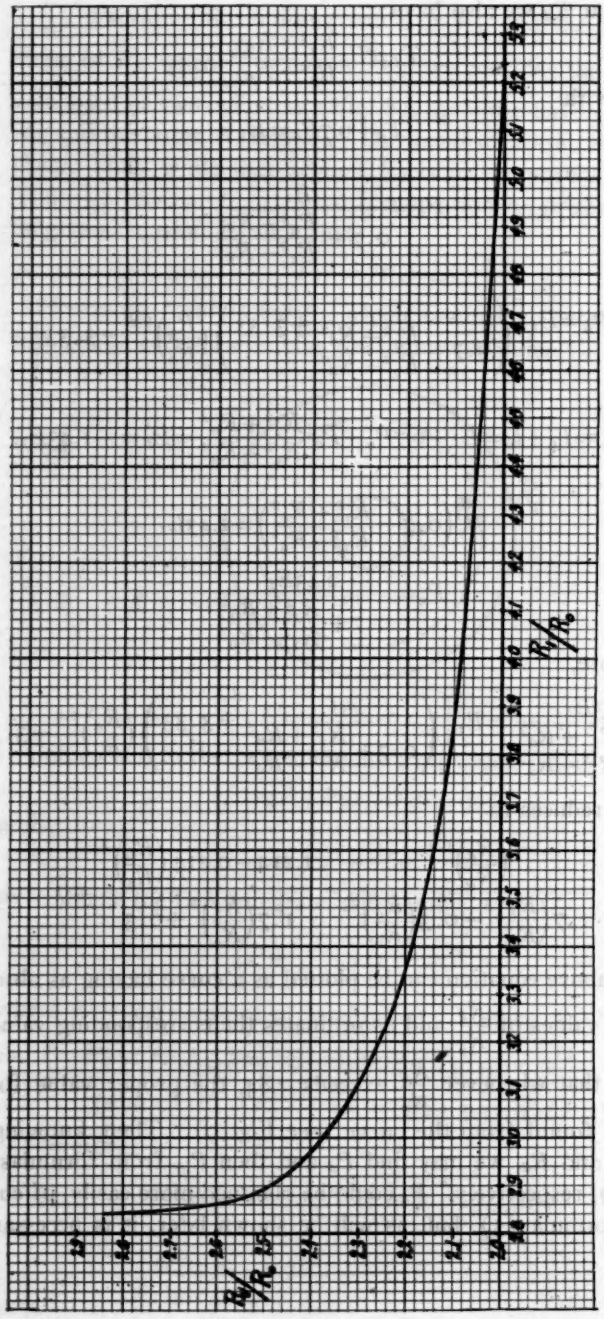


FIG. 9.—Curve for obtaining R_d, knowing R_o and R_i.

determine R_d, P_d and T_d in order to make the final strength calculations.

At this point it is desired to call attention again to the Emery gun, Fig. 3. The ratio of radii at Station 5 being $\frac{6.92}{1.80}$, or 3.84, the corresponding value of $\frac{R_d}{R_0}$, from our curve, is seen to be 2.10. R_d, then, should be 3.78 inches. Assuming $E_t = 58{,}000$ lbs. per sq. in., the corresponding value of P_0, from our formulas, would be 77,000 lbs. Now, as Fig. 6 shows, the actual pressure in the Emery gun was carried, on the second straining, up to 107,000 lbs.; and if there had been no overcompression of the bore on the return to rest, it should have been possible for the gun to withstand nearly the full 107,000 lbs. *elastically* thereafter. But, after the heat treatment designed to "set" the increased elastic strength of the metal had been applied, and the gun was again subjected to internal pressure, it was found that the new elastic strength of the gun was only about 75,000 lbs. (see Figs. 4, 5, 6 and 7). Does it not seem reasonable to say, then, that the rest stresses after the 107,000-lb. pressure was relieved, were practically the same as they would have been after applying only 77,000 lbs.? After applying and relieving the latter pressure, the bore would have been compressed to its elastic limit. A higher P_0 could not make it withstand a greater compression, and could therefore accomplish no increase in the elastic strength of the gun.

Now, as we have already stated, the gun, after the expansion process, may be treated as a simple elastic cylinder, containing different "initial" or "rest" stresses at the various points throughout its wall. The next question is: What happens to these rest stresses, and to the elastic strength of the gun (which we have assumed equal to P_0, the expanding pressure), when we remove metal, both inside and outside, in machining the gun to finished dimensions? Certainly the thinning of the wall is not the only effect. The compression at the new bore and the tension at the new outer surface will certainly be less than the original surface stresses were. In fact they cannot even be expected to retain their own former values, unless the amount of metal removed at each surface was practically the same. To illustrate this point more clearly, suppose that we turned the outer surface down until we reached that point near the middle of the

wall where the metal had been free from tangential stress. Would it now be free from stress? Hardly; the tangential compression at R_0 would have relieved itself, as the turning progressed, by distending all the layers exterior to it, so that when we arrived at the former "middle of the wall," we should find it in a state of

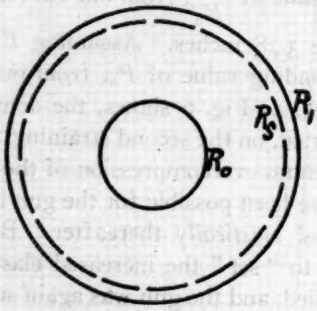


FIG. 10.

tension. And another cylindrical surface, approximately halfway between this point and the bore, would be the new "layer free from stress."

To take care of this effect of machining operations, it seems logical to continue our "superposition of stresses" principle. In

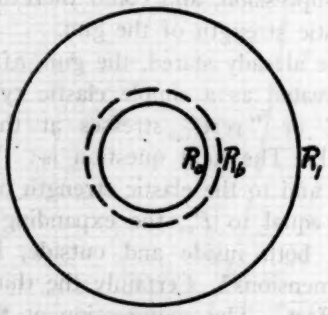


FIG. 11.

other words, consider our gun, before the outer metal was removed by turning, to be composed of two parts, with a contact surface at R_s (see Fig. 10). At this contact surface there is a radial rest pressure P_s. Removing the outer "hoop" relieves this surface of its contact pressure, and thus P_s vanishes. Hence the effect on all

the rest stresses in the remaining "inner tube" is the same as if a new pressure, $p_a = -P_a$, had been applied at R_a.

Likewise, boring the gun out from R_0 to R_b (see Fig. 11) is equivalent to applying at R_b a new pressure $p_b = -P_b$.

Now, while it might be of interest from a purely theoretical point of view, to determine the separate effects upon the stresses in the gun, caused by: (1) releasing the expanding pressure, (2) boring the gun to the finished diameter, and (3) turning down the outside surface to finished dimensions, all we need to know for practical purposes is the combined effect of all three operations, so that we may determine directly, from the action stresses, the final rest stresses, and from these the final elastic strength of the gun.

Let R_1 and R_0 = Outside and inside radii at time of expanding.

R_a and R_b = Outside and inside radii after finish machining.

P_a and P_b = Pressures or radial compressive stresses, at R_a and R_b, under expanding pressure P_0.

T_a and T_b = Tangential tensile stresses at R_a and R_b, under expanding pressure P_0.

t_a and t_b = Tangential tensile stresses at R_a and R_b due to $p_a = -P_a$ applied at R_a and $p_b = -P_b$ applied at R_b (caused by releasing P_0, and by boring and turning).

$\bar{T}_a$ and $\bar{T}_b$ = Tangential tensile stresses at R_a and R_b, under and R_b.

CASE I.—*When* $\frac{R_1}{R_0} \leq 2.84$.

$$P_0 = 3.33 E_t \left[\left(\frac{R_1}{R_0} \right)^{0.3} - 1 \right].$$

$$P_a = 3.33 E_t \left[\left(\frac{R_1}{R_a} \right)^{0.3} - 1 \right].$$

$$P_b = 3.33 E_t \left[\left(\frac{R_1}{R_b} \right)^{0.3} - 1 \right].$$

$$T_a = E_t - 0.7 P_a.$$

$$T_b = E_t - 0.7 P_b.$$

$$t_a = \frac{P_a(R_a^2 + R_b^2) - 2P_b R_b^2}{R_a^2 - R_b^2}.$$

$$t_b = \frac{2P_a R_a^2 - P_b(R_a^2 + R_b^2)}{R_a^2 - R_b^2}.$$

$$\bar{T}_a = T_a + t_a.$$

$$\bar{T}_b = T_b + t_b.$$

The final elastic strength of the gun is equal to that pressure in the finished bore which will just bring the finished outer surface to its elastic limit. This is:

$$P_b' = \frac{(E_t - \overline{T}_s)(R_s^2 - R_b^2)}{2R_b^2}.$$

This P_b' will not quite bring the bore to its elastic limit, unless no metal has been removed at R_1. In this case, of course, $P_b' = P_b$. But in any case, the above formula will determine correctly the final elastic strength of the gun.

CASE II.—*When* $\frac{R_1}{R_0} > 2.84$.

When $\frac{R_1}{R_0} > 2.84$, our limiting radius of deformations is not R_1, but R_d, whose relation to R_0, it will be remembered, is govgoverned by the stipulation that the metal at R_0 should not be compressed beyond its elastic limit in the state of rest. But in practice we are concerned with the compression at the *final bore*, R_b, which may be quite different from R_0. For instance, in order to simplify the expanding apparatus, we may have a uniform bore throughout the gun, during expansion, and then chamber it afterwards. In such a case, if we carried our deformations only to that R_d which would bring the *metal at* R_0 to its elastic limit upon relieving P_0, then, after we chambered the gun, we might easily find that the final elastic strength, P_b', would be entirely too low to be acceptable. Whereas, if we permit the metal at R_0 to be slightly crushed, and choose the higher value of R_d which will leave the *metal at* R_b at the elastic limit of compression after chambering, we shall have accomplished a considerable gain in the strength of the gun, while at the same time leaving the finished bore free from overcompression.

To find this higher value of R_d, we use $\frac{R_1}{R_b}$ instead of $\frac{R_1}{R_0}$ as the abscissa of the curve, Fig. 9, and call the corresponding ordinate $\frac{R_d}{R_b}$ instead of $\frac{R_d}{R_0}$.

Then:

$$R_d = \frac{R_d}{R_b} \times R_b.$$

$$P_d = \frac{E_t}{0.7 + \frac{R_1^2 + R_d^2}{R_1^2 - R_d^2}}.$$

$$P_o = (P_d + 3.33E_t)\left(\frac{R_d}{R_o}\right)^{0.3} - 3.33E_t.$$

$$P_b = (P_d + 3.33E_t)\left(\frac{R_d}{R_b}\right)^{0.3} - 3.33E_t.$$

$$T_b = E_t - 0.7P_b.$$

P_s and T_s are found as follows: If $R_s = R_d$, then of course $P_s = P_d$ and $T_s = E_t - 0.7P_d$. If $R_s < R_d$, then

$$P_s = (P_d + 3.33E_t)\left(\frac{R_d}{R_s}\right)^{0.3} - 3.33E_t.$$

$$T_s = E_t - 0.7P_s.$$

If $R_s > R_d$, then

$$P_s = P_d \frac{R_d^2}{R_s^2}\left(\frac{R_1^2 - R_s^2}{R_1^2 - R_d^2}\right).$$

$$T_s = P_d \frac{R_d^2}{R_s^2}\left(\frac{R_1^2 + R_s^2}{R_1^2 - R_d^2}\right), \text{ or } P_s\left(\frac{R_1^2 + R_s^2}{R_1^2 - R_s^2}\right).$$

Now, knowing P_b and T_b, P_s and T_s, we may find t_b, t_s, $\overline{T}_b$ and $\overline{T}_s$ from the formulas given for these stresses under Case I.

Then, if $R_s \lessgtr R_d$, the final elastic strength, P_b', is:

$$P_b' = \frac{(E_t - \overline{T}_s)(R_s^2 - R_b^2)}{2R_b^2}, \text{ as in Case I.}$$

If $R_s > R_d$, the final elastic strength will be equal to that pressure in the finished bore which will just bring the metal at R_d to its elastic limit, as was the case during expansion. This pressure is found as follows:

$$t_d = \frac{P_s R_s^2 (R_d^2 + R_b^2) - P_b R_b^2 (R_s^2 + R_d^2)}{R_d^2 (R_s^2 - R_b^2)}.$$

$$T_d = T_d + t_d = E_t - 0.7P_d + t_d.$$

$$p_d = \frac{P_s R_s^2 (R_d^2 - R_b^2) - P_b R_b^2 (R_s^2 - R_d^2)}{R_d^2 (R_s^2 - R_b^2)}.$$

$$\overline{P}_d = P_d + p_d.$$

$$P_b' = \frac{R_d^2 (R_s^2 - R_b^2)(E_t - \overline{T}_d - 0.7\overline{P}_d)}{R_b^2 (1.7R_s^2 + 0.3R_d^2)}.$$

One more formula will be found useful—that for determining the tension at R_1 due to the expanding pressure P_0 in the bore. Where $\frac{R_1}{R_b} \leqq 2.84$, this tension, T_1, is equal to E_t. Where $\frac{R_1}{R_b} > 2.84$,

$$T_1 = \frac{2P_d R_d^2}{R_1^2 - R_d^2}.$$

Knowing T_1, we also know the increase in outside diameter due to it:

$$\delta D_1 = 2R_1 \frac{T_1}{M},$$

where M is the modulus of elasticity, usually considered to be 30,000,000.

Thus we may know when the internal expanding pressure has reached its proper value, by measuring this increase in the outside diameter. For two reasons, this measurement should be used as the criterion for controlling the expanding pressure. In the first place, the diametral extension (or circumferential extension, as preferred), is easier to measure, continuously and with accuracy, than the extremely high pressures employed in radial expansion. In addition, it is admitted that Duguet's P_0 may have to be slightly exceeded to obtain the required T_1, except, perhaps, near the breech and muzzle. At any rate, by expanding the gun with a pressure slightly greater than P_0, and afterward assuming that our new resistance or elastic strength is only equal to P_0 (or P_b', based upon P_0), we are erring on the side of safety.

Examples of the action and rest stresses throughout the wall of a radially expanded gun are shown in Figs. 12 and 13. An elastic limit of tension equal to 60,000 lbs. per sq. in. is assumed, making the elastic limit of compression 86,0000 lbs. For simplicity, modifications of rest stresses due to machining are omitted.

In Fig. 14 there is shown a hypothetical monoblock gun of the same finished dimensions as one of our built-up guns. The dotted outline represents the forging from which the gun presumably would be made. Note that this forging, considered to be machined ready for the expansion process, is of uniform bore. The four different values of R_1, however, require four different solutions for P_0, as is indicated by the "expanding pressure" curve. Furthermore, the many changes of outside diameter in the finished gun necessitate a complete solution for P_b' and T_b at 12 points.

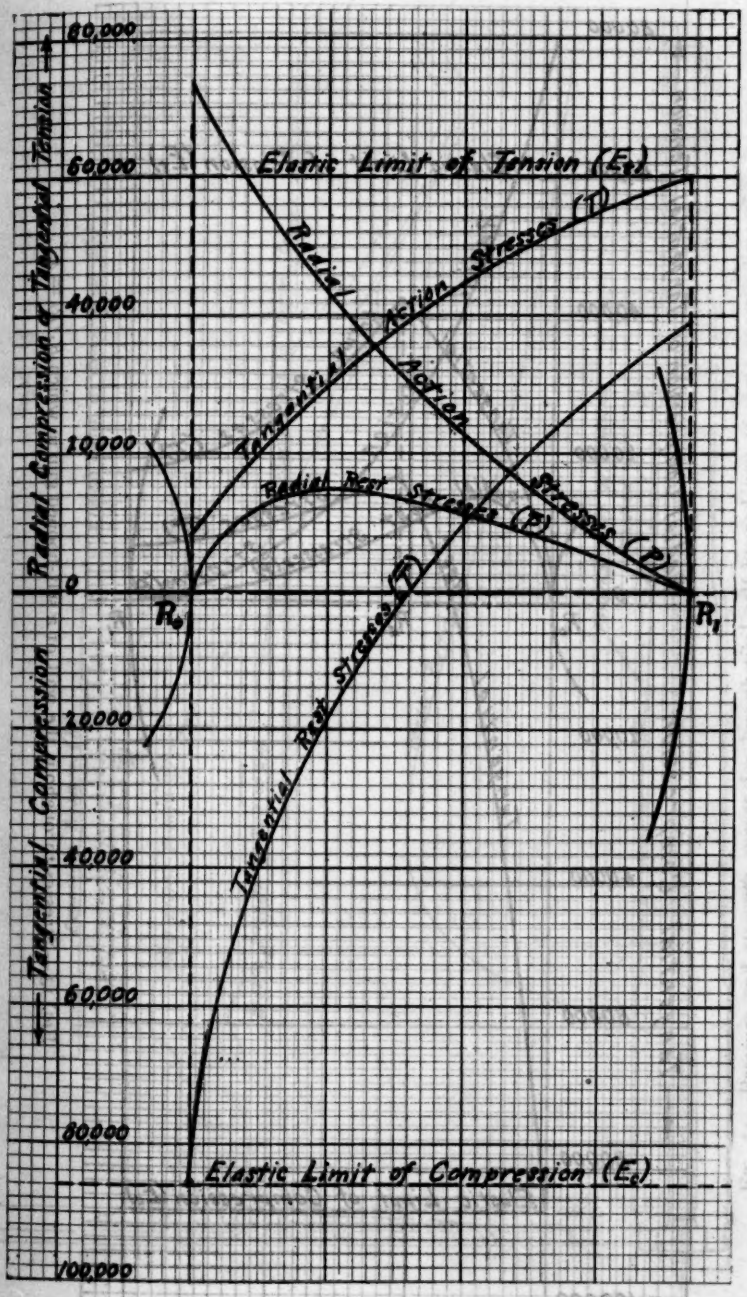


FIG. 12.—Stresses throughout the wall of a self-hooped gun in which $R_1/R_0 = 2.84$.

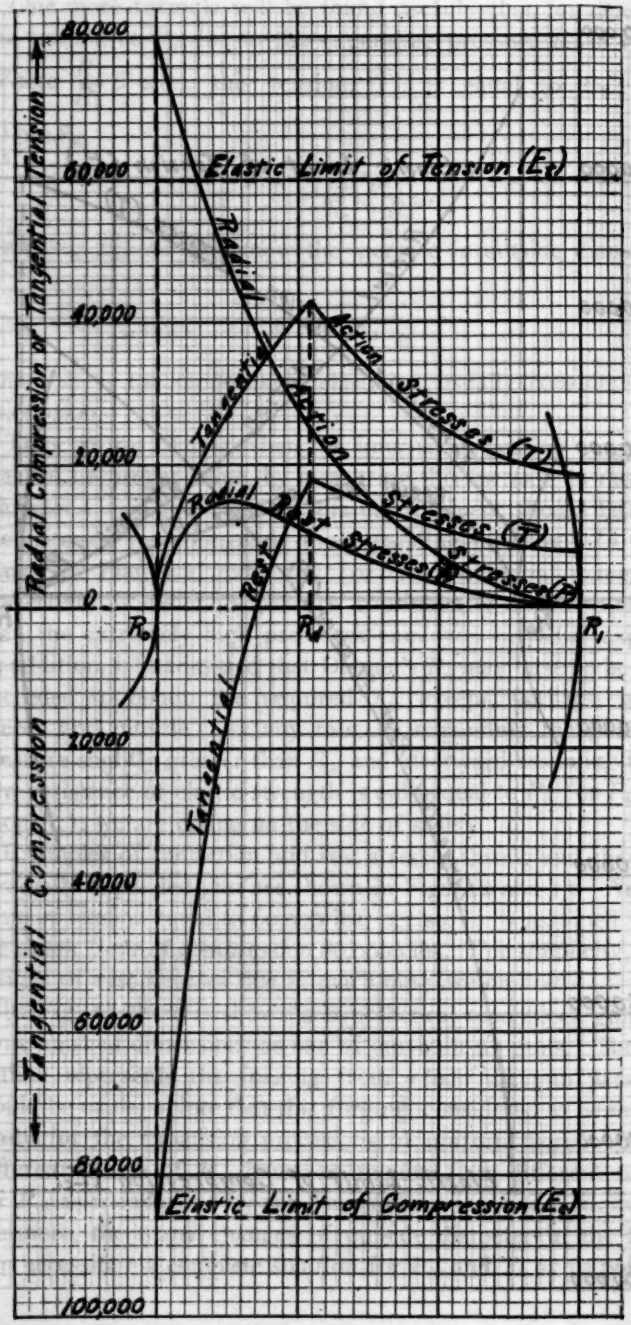


FIG. 13.—Stresses throughout the wall of a self-hooped gun in which $R_1/R_0 = 4$.

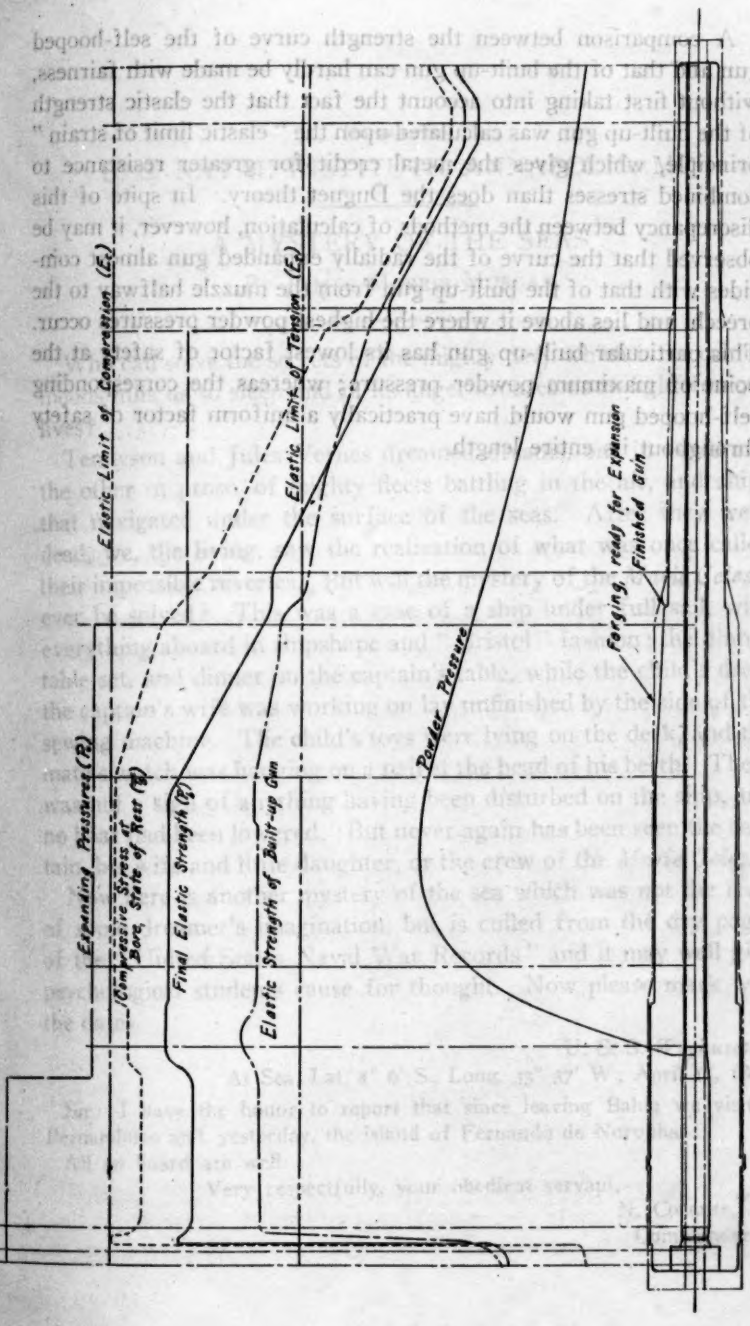
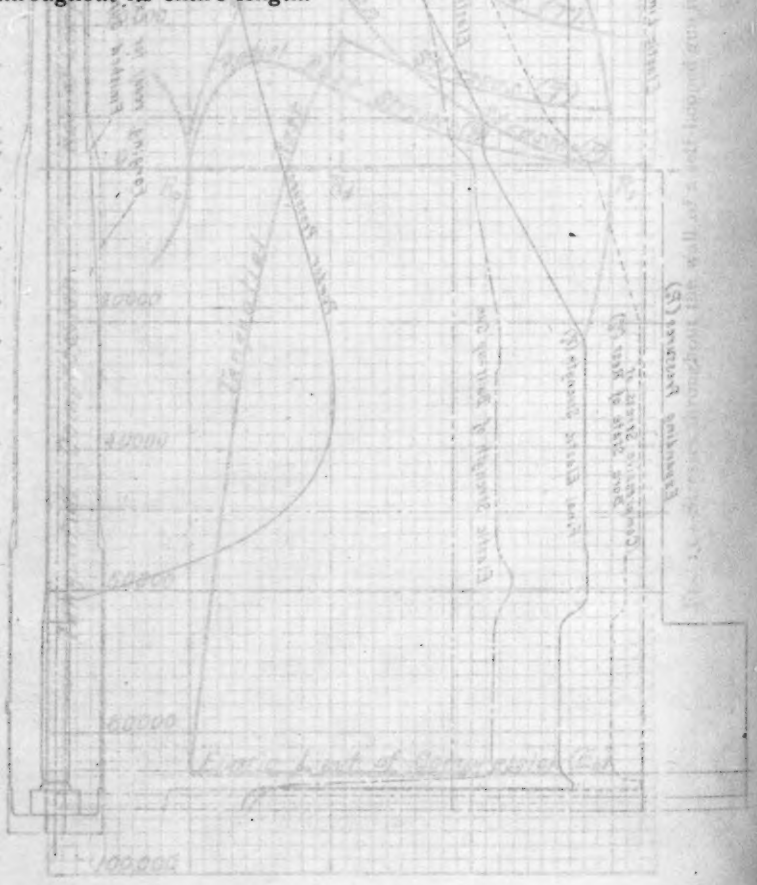

Elastic Limit of Compression (Ec)
Elastic Limit of Tension (Et)
Expanding Pressures (Pe)
Compressive Stress at Bore, State of Rest (Pi)
Final Elastic Strength (Pf)
Elastic Strength of Built-up Gun
Powder Pressure
Forging, ready for Expansion
Finished Gun

FIG. 14.—Pressure and strength curves for hypothetical self-hooped gun of same overall dimensions as one of our present built-up guns.

A comparison between the strength curve of the self-hooped gun and that of the built-up gun can hardly be made with fairness, without first taking into account the fact that the elastic strength of the built-up gun was calculated upon the "elastic limit of strain" principle, which gives the metal credit for greater resistance to combined stresses than does the Duguet theory. In spite of this discrepancy between the methods of calculation, however, it may be observed that the curve of the radially expanded gun almost coincides with that of the built-up gun from the muzzle halfway to the breech, and lies above it where the highest powder pressures occur. This particular built-up gun has its lowest factor of safety at the point of maximum powder pressure; whereas the corresponding self-hooped gun would have practically a uniform factor of safety throughout its entire length.



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A MYSTERY OF THE SEAS

By JAMES MORRIS MORGAN

Who can solve the secrets of the mighty deep which in its calmer moods lulls us to sleep and in its anger arouses us to fight for our lives?

Tennyson and Jules Vernes dreamed dreams, one in verse and the other in prose, of mighty fleets battling in the air, and ships that navigated under the surface of the seas. After they were dead, we, the living, saw the realization of what was once called their impossible reveries. But will the mystery of the *Marie Celeste* ever be solved? This was a case of a ship under full sail, with everything aboard in shipshape and "Bristol" fashion; the dinner table set, and dinner on the captain's table, while the child's dress the captain's wife was working on lay unfinished by the side of the sewing machine. The child's toys were lying on the deck, and the mate's watch was hanging on a nail at the head of his berth. There was not a sign of anything having been disturbed on the ship, and no boat had been lowered. But never again has been seen the captain, his wife and little daughter, or the crew of the *Marie Celeste*.

Now here is another mystery of the sea which was not the fruit of some dreamer's imagination, but is culled from the dry pages of the "United States Naval War Records" and it may well give psychological students cause for thought. Now please mark well the dates.

U. S. S. *Wachusett*

At Sea, Lat. 4° 6′ S., Long. 33° 37′ W., April 11, 1864.

Sir: I have the honor to report that since leaving Bahia we visited Pernambuco and, yesterday, the island of Fernando de Noronha.

All on board are well.

Very respectfully, your obedient servant,

N. COLLINS,
Commander.

Hon. Gideon Welles,
Secretary of the Navy, Washington, D. C.
(Enclosure.)

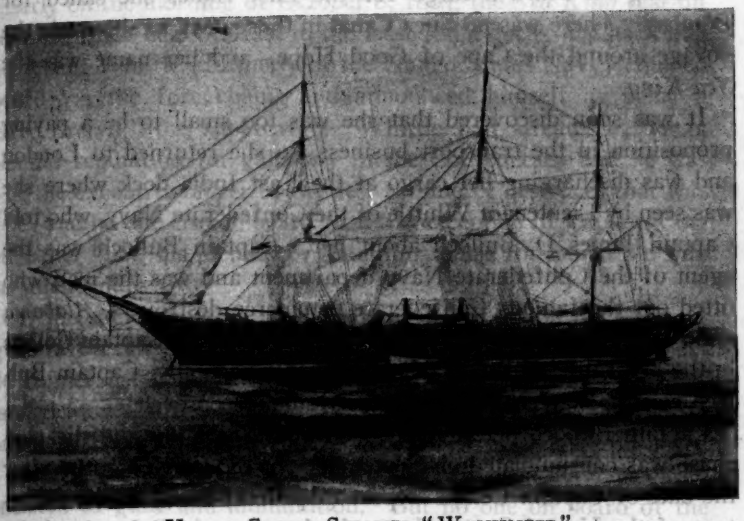
Captain Babcock, of American whaler *Lydia*, was informed by an English merchant at Hobart Town, a man of good standing and reliable, whom he feels sure would not attempt to deceive him (although it is possible that the merchant himself might have been deceived) that there was a steamer fitting out in England called the *Sea King*. She was to be ready to sail from England by middle of January. She was to proceed to Australia, calling en route at some place on Van Diemans Land for coal. Her object was to prey on the whalers in that sea. The merchant received his information from a person who had it from the agent of the vessel.

. . . . The above is a statement made by Captain Babcock, by whom we send a mail. Although the statement is not very likely to be true in all particulars, it may be well to ascertain if there is any truth in it.

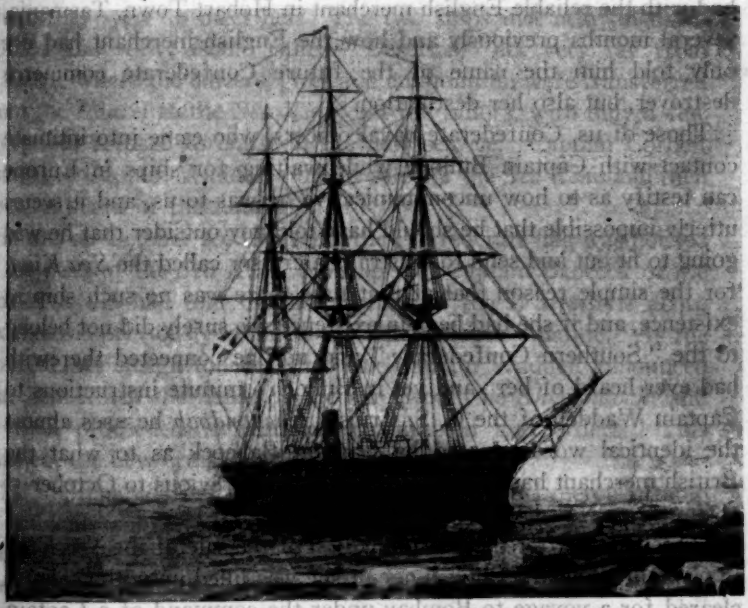
N. COLLINS,
Commander.

(April 11, 1864.)
See Naval War Records, Vol. 3, p. 10.

The information contained in the enclosure of Captain Collins' report was supposed to come from England via Hobart Town, in Van Diemens Land, or Tasmania, as it is now called, and its transmission to that port by sailing vessel would have required at least 100 days, and its transference from Hobart Town, via the Cape of Good Hope route, to within four degrees of the equator, at a point situated about in the middle of the Atlantic Ocean, by a leisurely and loitering whaling ship while engaged in her vocation must have required 140 days as a minimum. This rough calculation takes us back at least eight months prior to the time, April 11, 1864, which would be about August, 1863, when the rumor left the shores of England. Now it was not until the month of November, 1863, three months after the story told Captain Collins by the whaler in the middle of the lonely south Atlantic Ocean, that the keel of a vessel was laid in a Clyde shipyard that was intended for service in India waters and she was built unusually strong to enable her to fulfill the British government requirements to qualify her for charter in the transport business. When finished she was full ship rigged with very lofty masts and she was very heavily sparred. As she was not over 1000 tons' burden, much of her cruising on her long journeys was expected to be done under sail and to facilitate her slipping through the water her two-bladed screw could be triced up above the water-line. Her engine was of 850 horsepower.



UNITED STATES STEAMER "WACHUSETT."



CONFEDERATE STATES STEAMER "SHENANDOAH."

Taking on board a cargo for the East Indies she sailed for Bombay. There was no Suez Canal in those days so she made the voyage around the Cape of Good Hope—and her name was the *Sea King.*

It was soon discovered that she was too small to be a paying proposition in the transport business, so she returned to London and was discharging her cargo at the East India dock where she was seen by Lieutenant Whittle of the Confederate Navy, who told Captain James D. Bulloch about her. Captain Bulloch was the agent of the Confederate Navy department and was the man who fitted out the famous Confederate commerce destroyers, *Alabama* and *Florida,* the latter ship having been captured by Captain Collins in the neutral harbor of Bahia, Brazil. Incidentally, Captain Bulloch was the maternal uncle of ex-President Roosevelt.

Captain Bulloch determined to buy the *Sea King* and the purchase was consummated on September 16, 1864, five months after the date of Captain Collins' report (April 11, 1864) to the Secretary of the United States Navy of what Captain Babcock of the whaler *Lydia* had told him of the conversation he, Babcock, had had with the reliable English merchant in Hobart Town, Tasmania, several months previously and how the English merchant had not only told him the name of the future Confederate commerce destroyer, but also her destination.

Those of us, Confederate naval officers, who came into intimate contact with Captain Bulloch while waiting for ships in Europe can testify as to how uncommunicative he was to us, and it seems utterly impossible that he should have told any outsider that he was going to fit out and send to Australia a cruiser called the *Sea King,* for the simple reason that at that time there was no such ship in existence, and if she had been in existence she surely did not belong to the "Southern Confederacy" and no one connected therewith had ever heard of her; and yet in Bulloch's minute instructions to Captain Waddell of the C. S. Cruiser *Shenandoah* he uses almost the identical words quoted by Captain Babcock as to what the British merchant had told him nearly a year previous to October 5, 1864. (See Naval War Records, Vol. 3, p. 749.)

Immediately after the consummation of the sale of the *Sea King* to Captain Bulloch's English agent, she was filled up with coal and cleared for a voyage to Bombay under the command of a Captain Corbett, another English agent of Bulloch's.

Early on the morning of October 8, 1864, the *Sea King* cast off the lines which held her fast to the East India docks just as young Lieutenant Whittle (formerly of the United States Navy) climbed aboard via the fore chains and announced himself as being a "Mr. Brown," the supercargo. Whittle had already earned a splendid reputation for gallantry in the Confederacy and he was to be the executive officer of the new commerce destroyer that was to be; and no one else on board with the exception of Captain Corbett either knew his identity or the ultimate use for which the ship was intended.

On the same day that the *Sea King* left London a very fast, light-draft screw steamer, nominally English, but in reality a blockade runner belonging to the Confederate Government and commanded by a Confederate naval officer, left Liverpool supposedly bound for Havana, Cuba. There were a few passengers on board of her and they were the officers for the new cruiser. Her cargo consisted of guns and ammunition. But no one on board of the *Laurel*, with the exception of Lieutenant Waddell, who was to command her, knew the name of the ship they were to join or where they were to meet her. The two ships met near an uninhabited and rocky island called "Desertas," not very far from Madeira, where the officers, guns and ammunition were transferred from the *Laurel* to the *Sea King*, but the sailors, with only a few exception, refused to enlist in the new service. Captain Corbett handed to Captain Waddell a bill of sale for the *Sea King* and then went on board of the *Laurel*.

It was on October 20, 1864, that the Confederate flag was hoisted to the peak of the *Sea King*, the ship that Captain Babcock of the whaler *Lydia* had told Captain Collins of the *Wachusetts* about six months previously while in the lonely South Atlantic. As the Confederate ensign touched the peak Captain Waddell announced that henceforth the name of the ship would be *Shenandoah*, and he then proceeded to read his commission and orders. This finished, the new cruiser got under way.

So unprepared for being a man-of-war was this merchant ship so suddenly converted into a cruiser that port holes for her guns had not as yet been even cut in her sides, and so short handed was she that her officers took off their coats and went to work mounting and securing the guns while Captain Waddell, by way of furnishing one more pair of hands, took the wheel and steered the ship

himself, and she was headed for Australia where she was recoaled and refitted and from whence she proceeded to destroy the whaling fleet in the Pacific Ocean exactly as the British merchant had told Captain Babcock while he was in Tasmania a year previously, and before the *Sea King* had been built, that she would do.

Common people would call the British merchant's tale to Captain Babcock a case of "second sight," but whatever it was, the solution of the mystery must be left to those who delight to delve into the occult or the wonders of telepathy. The writer, a mere sailor, can only give the facts as culled from the pages of that very matter-of-fact government publication yclept "The U. S. Naval War Records."

The story of the cruise of the *Shenandoah*, alias *Sea King*, the "ship without a country," is a most interesting one, but suffice it to say here that she kept the seas for 12 months and 17 days during which time she captured 38 vessels of which number she burned 32, mostly whalers.

She was cruising in the North Pacific and it was not until four months after the surrender of General Lee, and the end of the Southern Confederacy, that she compelled the British bark *Barracouta* to "heave to" and from that vessel learned that her *de facto* nationality had ceased to exist several months previously. Upon the receipt of this news Captain Waddell at once ordered the dismounting of his guns, which were placed in the hold, and the disarming of his crew to protect them against being treated as pirates in case they were captured by a United States man-of-war, and then commenced the long and lonely voyage, under sail alone, to Liverpool, and despite the fact that the cruisers of the United States were scouring the oceans in search of her, the *Shenandoah* was never spoken by a single ship throughout the long voyage. She arrived safely at Liverpool on November 8, 1865, and there surrendered to the British Government. The last Confederate flag was hauled down, and forever disappeared from the seas.

The *Shenandoah* was next turned over to the United States authorities by the British Government and she was placed under the command of a Captain Freeman with orders to take her to America, but encountering bad weather, and losing some sails and spars, she returned to England where shortly afterwards she was sold to the Sultan of Zanzibar, and while in his service she became

a total wreck through having struck a coral reef in the Mozambique channel in 1879.

It may interest the reader to be reminded that it was Captain Napoleon Collins who, in the sloop-of-war *Wachusett,* rammed, boarded and captured, in the middle of the night, and in the neutral harbor of Bahia, Brazil, the Confederate cruiser *Florida* and sent her with a prize crew to Hampton Roads. The Brazilian Government having demanded an apology and the return of the captured ship, an army transport *accidentally* (?) ran her down and sank her at her anchors. To those in the "know" there was nothing occult about this.

DISCUSSION

Psychology and the Navy

(See Page 393, Whole No. 217)

Lieutenant (J. G.) F. H. Gilmer, U. S. Navy.—In the March number of the Proceedings Lieut. Commander McIntosh very ably discussed my article on "Psychology and the Navy." There are, however, a few statements that I will endeavor to refute, these statements to follow in the order in which they are found in the original discussion. I have answered each statement separately because I believe that it will tend to make the several subjects more clear.

"The catchword of the moment is 'Psychology'". . . . A catchword which has been the topic of seven books written by William James, the scientist. A catchword that is the name of a course of study found in every large university in the country. A catchword that is the subject of a text book at the U. S. Military Academy and to which Rear-Admiral L. H. Chandler devoted several pages in his thesis on "Principles of Command."

"Any one can define it for you." Yes any one can but probably the definition found in Funk and Wagnall's new Standard dictionary will suffice—"Psychology"—the science of the human mind or soul and its activities and capacities; the science that treats inductively of the phenomena of human consciousness, and of the nature and relation of the subject of them; mental philosophy.

"In application, however, it is as indefinite as 'Management' used to be." Indefinite in application and yet Columbia University is using it to select its scholars. Indefinite in application and we find several of the large business organizations employing it in the selection and distribution of their working forces. Indefinite in application and still it is used every day to weed out the mentally deficient from the public schools of several cities and it was used in the army, during the war, to select men who were to be classed as officer material.

"There is no need to 'introduce psychology in the navy.'" Perhaps we are far ahead of the army in this subject but all of the examples cited are to be found in that service and yet only last year a book by Lieut. Colonel Lincoln C. Andrews on the subject of psychology was introduced into the course of the U. S. Military Academy. In his thesis Admiral Chandler refers to seven subdivisions of psychology, any one of which is itself worthy of being introduced into the navy. No one of which has ever been fully appreciated by the navy.

"When trouble develops with personnel it will be found that it is nine times out of ten the result of psychology misapplied by some one." This

is one of the most convincing arguments that could possibly be advanced for the introduction of psychology into the service. Certainly the introduction will not increase the number of mistakes to ten out of ten; very probably it will reduce the number by at least one.

Then follows a long list of applications of psychology by great historical figures such as Drake and Farragut. Perchance if every naval officer were a Drake or a Farragut there might be no need of introducing psychology. However, such is not the case and so we must resort to some method that will assist us in emulating these men to some small degree. Psychology will.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Membership Life, regular and associate, 5452. New members, 27. Resignations, 9. Dropped, 1. Deaths, 1: Lieut. C. W. Johnson, U. S. Navy.

Practically the whole service receives the benefit of the PROCEEDINGS yet many officers, who read it monthly, are not members and therefore contribute nothing to the support of the Institute. Members are requested to urge non-members to join. Publication costs are now so high that the Institute is carrying a large monthly loss. The cost, per member, however, decreases with an increase in membership.

Dues The annual dues ($3.00) for the year 1921 are now payable.

Regular and associate members of the U. S. Naval Institute are subjected to the payment of the annual dues until the date of the receipt of their resignation.

Discussions Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid at one-half the rate for original articles, or about $2.25 a page.

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The Boat Book, 1920, and the Landing Force and Small Arms Instructions, 1920, are now ready for issue. The price of the former is 50 cents per copy, and of the latter $1.00 per copy.

In the early part of the summer, the Institute will publish three books, bearing the following titles: "The Aircraft Hand Book," by Lieut. Albert Tucker (C. C.), U. S. Navy; "How to Preserve Your Boiler," by Capt. E. P. Jessop, U. S. Navy, and "Composition for Naval Officers," by Professors Stevens and Alden, Dept. of English, U. S. Naval Academy.

The prices of these books will be announced later.

Index to Proceedings

The attention of readers of the PROCEEDINGS is invited to the classified analytical index for numbers 101 to 200 inclusive, which is noticed under "Publications." This is a most complete index, which has been prepared at considerable expense in order to make readily available the information contained in both the articles and the notes of these issues. Only a limited number of copies are being printed.

Articles

The Institute desires articles of interest to all branches of the service, including the Reserve Force. Attention is invited to the fact that the submission of articles is not limited to members, and that authors receive due compensation for articles accepted for publication.

Reprints of Articles

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Illustrations

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Notice Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, 146, 147, 173, 215 and 217 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, MD., May, 1921.

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PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER H. W. UNDERWOOD, U. S. Navy

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FRANCE

NAVAL NEEDS OF FRANCE.—Paris Senators have been just as emphatic as *Messieur les députés* were in their affirmation of the need of a strong navy, worthy of France's glorious traditions on the sea and of her world-wide colonial empire. Under stress of financial pressure, the 1921 *Budget de la Marine*, which the Chamber had reduced by 300 million francs, has been further shorn of 130 million francs, coming down to barely 800 million francs, partly wasted on the upkeep of 35,000 Bolshevist arsenal workmen employed in non-naval work. At first sight, this might appear to be a move in the wrong direction: *"Pas d'argent, pas de marine"*; but it was more than made up for by a fine display of good intentions and of naval eloquence. Since the war, owing mostly to the financial ruin (national debt of 300 milliard francs), brought about by the systematic devastations of the infamous Boche (who will turn out to be the true winner of the war) and by the failure of the Paris politicians of verbiage to enforce the long-overdue reparations, French naval construction has been at a stand-still (for the armed cargo vessels of the *Tahure* class are not *bona-fide* warships). Even the pre-war 900-ton *Enseigne Gabolde* has not yet been completed, in marked contrast with the activity prevailing in other navies; and so, naval eloquence and ever-changing programs of grand things to be done to-morrow have been the main productions of the *Rue Royale* Admiralty, under the patriotic, but powerless, Ministers Leygues and Landry. Indeed, if verbal and literary energy were an asset of naval worth, the *Marine Républicaine* would be greater than the *Marine Royale* ever was under the silent Colbert and the hard-working Sartines and Castries. No wonder Senator Bérenger, *Rapporteur du Budget de la Marine*, waxed somewhat sarcastic about the prevailing habit of showering *"couronnes de fleurs et encens"* on French naval men, and proclaimed it was time to pass from empty words to manly action that alone counts in the balance. Considering the present plight of the Gallic Navy, and the deep discouragement among officers, he asked for a *"programme de renaissance et de resurrection,"* not to change with the whims of every new minister, but

to be first discussed by Parliament and then to be carried out with the utmost speed.

The debate on the naval policy is to take place very shortly. After six years of stagnation, and in the light of the strides being made in rival navies, both parliamentary and naval men are agreed as to the need of an immediate effort with a view to restoring the fast-declining naval prestige of the Republic. The security of the coasts of France against landing and bombardment, and the safety of the maritime routes between France and North Africa, have been again and again mentioned as being the limit, for the present, of France's naval ambitions. Modest enough in appearance, extremely costly in practice, since aerial and ballistic superiority, together with a high degree of submarine and mining efficiency, are nowadays required to ensure the complete protection of coasts. The day is past of short-range warfare when coast defence could be organized on economical lines. To efficiently defend the coasts means that the whole problem of sea warfare must be satisfactorily solved; otherwise only make-believe results can be arrived at. Similarly, the securing of safe communications in the Mediterranean means that French naval and aerial supremacy in those waters must be so great as to discourage aggression. It must be uncontested. Such is not the case at present. Italy officially claims the supremacy, and with some reason; the cruiser fleet and the flotillas of the Peninsula have a distinct advantage in the matter of quality, and her aeronautical branch is well to the fore. Having suffered less from the war than France, she has been able to devote more attention to her naval armaments and to forge ahead. When is remembered the detrimental influence two isolated Boche cruisers without base near at hand exercised over the movements of the *Lapeyrère armée navale* and of Algerian troopships, it requires no great imagination to guess what would happen in the case of a war with a power enjoying the use of the many offensive bases of Sicily, Sardinia, and of Northern Italy. It is here that bold tactics of offence appear as the only practical safe and paying course, and ability to inflict greatest damage in the least time is the best insurance against war. No wonder Admiralty experts are giving special attention to the revolutionary changes in Mediterranean strategy brought about by war developments.

The recent move of the British Admiralty in the matter of new construction is considered here an object lesson to France, whilst the decision of Bocheland to start anew making her future on the sea, and without any ado, at the moment when she is proclaiming herself too poor to comply with the clauses of the Treaty she has signed, is justly held to be an insult to France and a challenge to Great Britain.

The Guisthau program, that is certain to be approved by Parliament, marks a considerable advance over previous projects of construction as regards both quality and number, and it will have the effect of vastly improving the naval position of France a few months hence. It will comprise six cruisers of 8000 tons and 34 knots, that will closely resemble the British *Hawkins*, excel the U. S. *Omaha* class, and totally outmatch Mediterranean scouts; 12 super-destroyers of 2200 tons, 36 knots, and 5.5-inch armament, to excel most, if not all, destroyers afloat; 12 *torpilleurs d'escadre* of 1000 tons and 35 knots of the improved *Gabolde* type; 36 submersibles of 600 and 1300 tons, very carefully studied with a view to robustness and reliability, and to be constructed at a rapid rate by state arsenals and private yards, an arrangement calculated to promote emulation and good work.

Preparations are being made to commence, this year, 3 cruisers, 6 super-destroyers, 12 *torpilleurs*, and 12 submersibles of the most powerful type. Moreover, the 190-meter ex-battleship *Béarn* is to be completed as a *porteavions*, despite the criticisms Admiral Guopratte made in the Chamber as to her lack of speed. When launched at La Seyne in 1918 she was built up to the main armor deck, and only weighed 5000 tons.

Since then her sides have been partly completed, and she received a temporary superstructure for the purpose of aviation experiments that were conducted under the supervision of Admiral Violette, and proved satisfactory. She is to be ready by 1923, and her transformation, with a speed of at least 23 knots and a very strong anti-submarine defence, is to entail an expenditure of some 60 million francs, whereas four years and over 100 million francs would be necessary to construct a 35-knot seaplane carrier on American lines. The Guisthau program will cost over one milliard francs, for it is probable that the cruiser and destroyer units to be laid down in 1922-3 will be larger than the 1921 type, superior quality over all comers being the desideratum of French naval men.

The coast defence organization is to be revised on up-to-date lines. British war exploits against Boche bases on the Belgian coast have shown it would be a mistake to entirely rely on aerial and submarine "defensive-offensive." Seaplane flotillas are extremely fragile and vulnerable, as recent experiments in the Channel and Mediterranean have shown; and and there is a limit to the number of submarines. Well-sheltered and posted gun batteries, thoroughly trained from peace time on realistic lines, afford the most reliable protection for naval bases and important strategic points. The comprehensive tests now proceeding at Gâvres with new explosives and new types of shells have made it clear that (for special reasons) 13.4 and even 12-inch guns on commanding positions on shore can be relied upon to outrange the most powerful superdreadnoughts afloat, whilst quick-firing 5.5-, 6.5-, and 7.6-inch weapons can render quite a wide zone unhealthy for destroyers and submarines, especially with the strides being made towards a solution of the night-firing problem.

Senator Tissier, who acted as the "*bras droit*" of ex-Minister Pelletan, criticized the presence in Paris "*notre plus grand port de guerre*" of too many officers *de vaisseau, paperasserie* making instead of actively preparing for war, which is their sole *raison d'être*. Some time since an old admiral denounced in *La Revue Hebdomadaire* the land-lubber inclinations of too many young gentlemen in blue, and, of course, the reduced number of ships in commission tends to turn too many of our 2300 *officiers de marine* into bureaucrats. A good weeding out will strengthen the fighting spirit of the service. Happily, the great bulk of the *Marine Française* is composed of true seamen, who are never more happy than when at sea. Senator Tissier urged the adoption of an official "*doctrine navale*" framed in accordance with the lessons of the war, and he meant on *la jeune Ecole* lines. It is doubtful if this is at all desirable; it is a mere catch-word, seeing that the naval science is ceaselessly changing, and even now is being changed as the result of post-war ballistic and aerial developments.

Great satisfaction has been caused by the appointment as chief constructor (in place of M. Maurice) of Ingénieur-Général Doyère, the creator of the *Normandie* quadruple-turret type of battleship, who is the most original and talented battleship designer the *Marine Française* has seen since the days of M. de Bussy (1889-91), creator of the *Dupuy de Lôme* and *Baudin* types. In the matter of scientific education and of theoretical attainments French *ingénieurs* have probably no rivals, but the strong point of M. Doyère, who at one time acted as chief constructor of the Chinese Navy, is a wide and solid practical experience, together with a go-ahead and inventive turn of mind. He thus possesses the qualities of those *grands ingénieurs du passé* who made French naval architecture first in the world. The able Hubac, who designed the fleet of Colbert, had previously studied in England and Holland; Forfait (1752-1807), rival of Sané, had done likewise. Chief Constructors Boucher (1825-1830), creator of the famous *Surveillante* frigate type; Dupuy de Lôme, who revolutionized naval architecture, and his worthy disciple, de Bussy, all proceeded on practical experimental lines with the avowed ambition of excelling for quality France's then only rival, the great British Navy.—*The Naval and Military Record*, Apr. 20, 1921.

GREAT BRITAIN

THE NAVY ESTIMATES AND THE CAPITAL SHIP.—The outstanding feature of the navy estimates, presented to Parliament during March, is the decision of the British Government to continue the building of large capital ships. The wisdom of such a policy has been much criticized in certain quarters; but in view of the considered opinion of the British naval staff as expressed a year ago that the necessity for the capital ship had survived the test of the war and still formed the unit on which sea power was built up—an opinion since endorsed and acted upon by the United States and Japan—it cannot, we think, be gainsaid that the British Government has come to a wise decision in the matter, especially as such a decision was not made until the matter had again been examined by a special committee set up for that purpose. As we have already stated, the question is one which only experts with a full knowledge of the facts of the war can decide, and must in the nature of things involve a compromise of conflicting factors based upon the probabilities of the case. Undoubtedly there has been a tendency by some to overstate the dangers of attack by aircraft and submarines.

In introducing the Navy Estimates in the House of Commons, Sir James Craig, Financial Secretary to the Admiralty, stated that it was intended to build four new vessels to replace the four oldest capital ships now on the effective list. The new ships would be an improvement on the *Hood* class embodying the lessons of the war. The keels would all be laid during the next twelve months, but it had not yet been decided where the ships were to be built, and it would be impossible to make much, if any, progress with the new ships until late in the autumn. A sum of two and one-half millions has been included in the Estimates as a first instalment for these vessels.

As regards other new construction, it is proposed to build a submarine and a mine-layer, both of which will embody the latest developments in these types of craft, and will also include a number of experimental features.

The object of the government's naval policy, as mentioned by the First Lord of the Admiralty in a statement explanatory of the Estimates, is to maintain a "One-Power Standard," *i. e.*, that the British Navy should not be inferior in strength to that of any other power, and, in his own words:

"The Government neither commits itself to, nor contemplates, any building '*programmes*' in answer to those of any other Power. Indeed, it trusts that it may be possible, as a result of frank and friendly discussion with the principal naval powers, to avoid anything approaching to competitive building, either now or in the future."—*The Shipbuilder*, April, 1921.

FLOTILLA LEADERS.—A description, with photographs, is given in this article, of the various types of flotilla leader built for the British Navy from their inception in the *Marksman* and *Lightfoot*, 1913-14 program, to the *Shakespeare* and *Scott* classes, completed 1917-19. Details of armament, speed, power, machinery, etc., are given in the article. In passing, it is mentioned that for all-round fighting and sea-going qualities, the later boats are probably the finest boats extant. Their armament consists of five 4.7-inch and one 3-inch A. A. guns, and two sets triple 21-inch torpedo tubes. The nominal speed is 36 knots at light load on 40,000 s. h. p., but on trial speeds of 37.7 to 38.7 knots were attained. (*Marine Engineer and Naval Architect*, Feb., 1921.)—*The Technical Review*, Apr. 26, 1921.

NEW SUBMARINES.—So much attention was created by the announcement that the Government had decided to begin the construction of four new capital ships, to replace four vessels which had become obsolescent, that hardly anyone seems to have noticed the fact that it is also intended to build two other vessels of fighting types, a submarine and a minelayer.

It is true that no indication of this was given in the First Lord's explanatory statement, but in introducing the Estimates in the House of Commons Sir James Craig said: "We also propose to build a submarine and a minelayer, both of which will embody the latest developments in these craft, and will also include a number of experimental features." There is likely to be an even greater interest shown later on in the design and progress of these two vessels than in that of the capital ships. The latter, we know, will be improvements on the *Hood;* they will not be very much bigger, since it has been indicated that any dock which will take the *Hood* will take them also; and they are to embody the lessons, especially in regard to armament and protection, learned during the late war. But no similar hints have been given about the two smaller craft, particulars of which will thus be the more keenly awaited.

The outcome of the war was to confirm British naval designers in their plans, so far as big ships were concerned. The *Hood* thus affords a sound basis on which to prepare the designs of the new vessels, modified, of course, by battle experience and the studies of the past two years. But when the end of the war came, submarine construction was in no such settled state. We had in hand some small vessels of the 12-knot *H* type; others of the huge steam-driven *K* class, built for ocean-going work in company with the Grand Fleet, and still the largest and fastest submarines in the world; others, again, of the *L* type, designed for 17½ knots, and embodying the best results of earlier oil-engined vessels; and, lastly, a series of three submarine mŏnitors of the *M* class, mounting a 12-inch gun apiece. It seems evident that the installation of steam machinery in the *K* type was a war time expedient which will not be repeated, but it will be no easy task to obtain from internal-combustion machinery a speed approaching the 24 knots which this remarkable though complicated type attained on the surface. The Admiralty Engineering Laboratory at West Drayton, for which increased financial provision is made this year, is largely concerned with researches and experiments in heavy fast-running marine oil engines, and it may be hoped that as a result of the work here it will be possible to instal in the new submarine engines of greater power than any yet adopted. To the submarine cruiser which Rear-Admiral S. S. Hall has advocated, of about 3000 tons with a sea endurance of 50,000 miles and six months, is probably a far cry. It will be interesting to see how near the new vessel approaches to it.

If there is no clear indication of the design of the new submarine to be gathered from past practice, still less is there any hint in regard to the minelayer. It appears that no ship has ever been built specially for this duty. We began the war by using obsolete cruisers for the purpose, and when these were found too slow, various kinds of other craft, such as destroyers, were utilized. Later on it was found desirable to equip submarines to lay mines, and the advantages of under-water craft in this connection would seem to be so great that there are many people who will expect to see the new minelayer with submersible powers. The only minelayer now on the active list, the *Princess Margaret,* has been very costly. Originally a 5000-ton liner, chartered and converted during the war, she was purchased in 1919, and in the coming year is to have £76,000 spent upon her for repairs and alterations. Though not exceptionally fast, she can carry a much larger supply of mines than regular war types can without interfering with their ordinary duties.—*The Army and Navy Gazette,* Apr. 16, 1921.

THE NAVY AND THE CRISIS.—Without touching upon the outcome of the negotiations between the coal owners and miners which, at the moment of going to press, are in progress, it is only right that a word of congratulation should be given to the Admiralty for the completeness and efficiency of their preparations to aid the civil power in case of an extension of the strike. The nation instinctively looks to the sailor in a time of trouble,

and once again its faith in him has been justified. There was a ready response to the order for the mobilization of the Royal Fleet Reserve, but long before the men of this force had begun to assemble at their ports the ships of the Atlantic Fleet had left for their emergency stations all round the coast. The presence of the battleship *Valiant* in the Mersey must by now be considered a hardy annual. She was there, we believe, during the railroad strike of 1919 and the coal strike of 1920, and so it was again to Liverpool that she was sent from Devonport last week. Similarly, the *Warspite* went to the Clyde, the *Delhi* to Cardiff, the *Dunedin* to the Humber, the *Dauntless* to Avonmouth, and other vessels were distributed accordingly. The offers of service from officers were so numerous that the Admiralty on Saturday night found it necessary to acknowledge them publicly; since they could not all be replied to. As regards the men, the presence of blue uniforms at Chelsea Barracks, turning this artistic quarter of London into a miniature dockyard, came as a plain indication that the Admiralty were ready with skilled men to send to the power stations or other centers where they might be needed to help in keeping going the life of the community. Happily, by Saturday night the situation had become easier, and everyone who has any regard at all for the welfare of his country will be glad if the elaborate machinery prepared for the emergency, and of the existence of which such a good indication has been given, will have no need to function.—*The Army and Navy Gazette,* Apr. 16, 1921.

A NAVAL EXCHANGE.—During the war, when British and American warships were working together in many seas, and the comradeship between the two navies was intensified by the perils and hardships of active service jointly performed, someone suggested that this naval entente ought to be perpetuated when peace returned by a system of exchanging squadrons. The idea was that at certain periods a force of British battleships or cruisers should be attached to the American fleet for cruising or maneuver purposes, taking its orders from the American Commander-in-Chief; while an American squadron should be similarly incorporated in one of the British commands. We believe we are correct in stating that an informal proposal to this effect was made to Admiral Rodman by the King when His Majesty was visiting the American admiral on board his flagship, the *New York*. At that time a force of American dreadnoughts actually formed part of the Grand Fleet, under the orders of Admiral Beatty, and it must have seemed the most natural thing in the world that the co-operation which had been brought about by stress of war should be continued in after days for the purpose of preserving peace. Since that time the idea has been revived by various American organs, but nothing has been done officially to give it effect. That the fraternal spirit which prevailed in the war is still very much alive is evident from the reception accorded to Admiral Sir Lewis Bayly on his recent visit to the United States. There is no doubt that the British Admiralty would cordially respond to an invitation to send a cruiser squadron to sail for a time with the U. S. Atlantic or Pacific fleet, and if an American force could simultaneously join up with our Atlantic fleet it would be welcomed with enthusiasm. We recognize, however, that the initiative must come from the Cabinet, not from the navy, and Cabinets are notoriously reluctant to take any step, that savors of the unconventional. Meetings between heads of governments are difficult to arrange when three thousand miles of ocean separate them, but they can keep in touch with each other through accredited intermediaries, and if it be true that President Harding intends to send a diplomatic mission to this country to discuss the limitation of armaments and other subjects, our government should take the opportunity to submit a formal proposal for the exchange of naval squadrons. Such an arrangement would constitute an effective guarantee of peace on the great waters.—*The Naval and Military Record,* Apr. 6, 1921.

AN ANGLO-AMERICAN NAVAL AGREEMENT.—We do not know what steps, if any, have been taken by the government to give effect to the desire of an overwhelming majority of the British people to come to an understanding with the United States on the question of naval armaments. It takes two to make an agreement, and it is impossible as yet to say whether American public opinion as a whole desires such a compact as would rule out the danger of competitive naval shipbuilding between the two great English-speaking nations. There has unquestionably been a reaction from the Wilsonian policy of co-operation with European Powers in the settlement of European problems, and at the present moment American statesmanship seems to be guided by the principle of abstention from those "entangling alliances" against which Washington, in his valedictory address, solemnly warned his countrymen. No sensible person will blame the United States for wishing to keep out of the Serbonian bog of European politics. Down to the end of the 19th century we in this country did our best to keep politically aloof from the continent, and even to-day there are many here who would fervently welcome a return to the "splendid isolation" from which circumstances compelled us reluctantly to depart. Barely 20 miles of water separate England from the continent, yet that "silver streak" had been for hundreds of years the determining factor in our foreign policy. It is therefore easy to realize why the Americans should be loth to involve themselves in the affairs of a continent from which they are separated by 3000 miles of ocean.

The inspired statements issued at Washington last week in regard to the visit of M. Viviani have served to clear the atmosphere. President Harding has made it plain that his administration cannot contemplate anything in the nature of an alliance with France or any other power. It remains to be seen whether he considers a naval agreement with this country as coming within the category of those foreign commitments which he and—as we believe—the mass of the American people are determined to avoid. If negotiations to this end are to be undertaken at all, they will demand the utmost tact and delicacy. For, as we are learning to our cost, the problem of working out a standard of relative naval strength satisfactory to both parties is by no means so simple as it looks at first sight. The first point on which enlightenment is needed is whether the American government would be content with a navy of approximately the same strength as our own. If so, then the main obstacle to an agreement disappears at once, for the British government has already expressed, though the First Lord of the Admiralty, its readiness to accept naval equality *vis-à-vis* the United States. It appears, however, that the Washington authorities are disinclined to make a pronouncement on this point until they have satisfied themselves that the Anglo-Japanese alliance is entirely without naval significance so far as the United States is concerned. The anti-British elements have been playing this card for all it is worth, and their persistent propaganda has succeeded to the extent of creating doubt in the American mind as to the wisdom of accepting naval equality with Great Britain whilst the latter remains the ally of Japan.

We must not blame the American people for regarding as a possibility that which every Briton knows to be a chimera, namely, an Anglo-Japanese armed league against the United States. It has been dinned into their ears by the Hearst newspapers that the alliance contains "secret clauses" which are susceptible of such an interpretation. This lie ought to be nailed to the counter once and for all. In Japan the foreign minister has repudiated it in the most explicit terms, but our own government has so far contented itself with a semi-official *démenti* which does not and cannot carry the weight that would attach to a definite and unequivocal statement by the Prime Minister or Lord Curzon. Niceties of diplomatic etiquette are perhaps responsible for our government's silence, but in a matter of this vital importance punctilio might safely be disregarded for once. The Japanese alliance may still have its uses, but no rational person can doubt

that an Anglo-American naval agreement would be infinitely more desirable on all grounds. As we have said before, it would involve none of the difficulties which inevitably shipwrecked every pre-war attempt to bring about a *pari passu* reduction of Anglo-German sea armaments. To put the matter quite bluntly, we could not trust Germany, and it goes without saying that common trust is the only foundation for an agreement of this kind. In the case of the United States, however, we could depend upon her scrupulously to observe any standard which she might have accepted, and we think our own pledge would be honored with as little hesitation by her. There need be no splitting of hairs as to the exact fighting value of individual ships. A mutual assurance that neither country would seek to outbuild the other would suffice. We believe such an arrangement to be eminently practicable. It seems to us—as it seemed to Mr. Balfour five years ago, when the Great War was at its height—" that the lesson to be drawn from history by those who love peace, freedom, and security is not that Britain and America should be deprived, or should deprive themselves, of the maritime powers they now possess, but that, if possible, those powers should be organized in the interests of an ideal common to the two states, an ideal upon whose progressive realization the happiness and peace of the world must largely depend."—*The Naval and Military Record*, Apr. 13, 1921.

GERMAN AND BRITISH CHEMICAL INDUSTRIES AND THE WAR.—The intimate connection between German dye works and munition and poison gas has been so strongly urged during and after the war, in the chemical journals as well as in the general press, that it hardly required the publication of a White Book to draw renewed attention to the subject. The introduction to the report of the British mission appointed to visit chemical works, issued as an army paper this week, will, however, help to make the official standpoint clear, and it will also serve to reduce the problem to its actual dimensions.

The British mission, appointed to visit chemical factories in the German territory on the Rhine now occupied by the Allies, consisted of seven experts under the leadership of Brigadier-General H. Hartley; they were accompanied by delegates from America, Belgium, France and Italy, and spent two weeks in February, 1919, in the chief chemical works of the district. Some years before the war three of the largest chemical concerns, the Bayer Company of Elberfeld and Leverkusen, the Badische Anilin- und Soda-Fabrik, and the Aktien-Gesellschaft für Anilin, had combined in a group. A second group was then formed, comprising the firms of Meister, Lucius und Brüning, Casella, and Kalle. During the war the two groups amalagamated, and their Interessen-Gesellschaft I.G. was joined by the firms of Griesheim-Elektron, Weiler-ter-Meer, and others. Not all these chemical works were visited, as they were not all situated in the occupied zone; but the inspection was extended to some of the larger explosive works of the district, such as the Rheinisch-Westfälische Sprengstoff A.G. of Troisdorf, the Carbonit A.G. of Schlebusch, the Rheinische Dynamit fabrik, of Upladen. The procedure adopted was to study, in the first instance, the lay-out and pre-war capacity of the works and their utilization, especially as regards explosives and poison gases, and extension for war purposes, and then to inquire into the processes of manufacture. Valuable information was obtained, although most of the special departments were no longer in operation, and enquiries were not readily answered.

The factories inspected can hardly be considered, it is pointed out, as representative of the explosive industry of Germany, and arrangements for ultizing the dye works for war purposes do not appear to have been made before the war; the chemists had later to be recalled from the front. Only a very small proportion of the propellant explosives used came from the dye factories, and very little before 1916. Of the explosives, trinitrotoluene was the most important, picric acid and dinitro benzene coming next; as over here, ammonium nitrate (about 40 per cent) was mixed with the high

explosives. The German and British methods of manufacture were found to be very similar taken generally, but the blockade restricted the Germans heavily as to raw materials. The nitric acid was, in Great Britain, practically all made from saltpetre; over there ammonia had to be oxidized into nitric acid, and paper crepe and glycol took the place of cotton and of glycerin. Glycol is ethylen alcohol; before the war it had served as a substitute for glycerin, which it resembles, being also a sweetish, rather sticky fluid, but only for certain pharmaceutical preparations. The use of these new raw materials and of plant originally designed for the other purposes necessitated various modifications, some of considerable difficulties, in the processes. On the whole the commissioners consider that the German methods were not superior, and in some respects inferior to the British practice, and that the high-level efficiencies of British factories were hardly reached.

The poison-gas manufacture was concentrated in the occupied zone, and the bulk of the poison-gas factories had previously been producing dyes and pharmaceutical products. Different stages of manufacture were allocated to different works, in many, but not in all, cases to the advantages of rapidity and efficiency. Thus, for instance, the famous mustard gas was made by the old three-stage process of Viktor Meyer, partly in Ludwigshafen and partly in Leverkusen, many miles further down the Rhine, whilst a rapid and more efficient one-stage process was quickly worked out at Cambridge when the nature of the gas had been recognized. The German output figures are certainly impressive; but they have been equalled over here. The key of the whole chemical war industry was the synthetic ammonia manufacture by the Haber process. That was started at Oppau in 1912, chiefly to obtain ammonia salts for fertilization. The daily ammonia production there was raised from 25 metric tons in 1914 to 250 tons in 1918; the Leuna works in the Merseburg Government district brought that production up to 650 tons in 1918. The daily production of nitric acid was increased threefold, to 719 tons, during the war; the chlorine manufacture rose from 37 tons to 63 tons per day. Chlorine and phosgene were first the chief poison gases; later the I.G. works supplied varied organic compounds, and for their manufacture the dye works certainly offered facilities which did not exist in this country.

As regards the military importance of the German chemical industry the report states: "Although no arrangements had been made to utilize the chemical works at the outbreak of hostilities, the works were rapidly converted to war purposes, thanks to their highly-trained personnel and the great technical resources of their peace organization. In the future every chemical factory must be regarded as a potential arsenal, and other nations cannot, therefore, submit to the domination of certain sections of chemical industry which Germany exercised before the war. . . . . As it is clear that the military strength of a country depends to a large extent on the development of its chemical industries, it is necessary to review the present condition of these industries in Great Britain and Germany." The linking-up of the heavy chemical trade (acids and alkalis) in which England had always been leading, with the production of dyes and fine chemicals was one of the strong German features; another was scientific organization, in the office as well as in the laboratory and factory. English chemical industry had her triumphs, too, during the war, also under heavy difficulties, though of different kinds. If there are no synthetic ammonia works yet in this country, Claude claims to obtain much higher yields than Haber by working at very high pressures, and research is being pushed everywhere. "The rapid growth of British chemical industry during the war proves that it can successfully compete with Germany provided that reconstruction is undertaken on a sufficiently large scale." We do not wish, on this occasion, to add anything to these concluding words of the report. The problems affect the general national policy.—*Engineering*, Apr. 22, 1921.

THE CONDUCT OF A NAVAL BATTLE.—*A lecture delivered at the Royal Artillery Institution, by Commander R. F. Seymour, C.M.G., D.S.O., R.N.*—Of all the more important events in war a decisive naval battle is perhaps the most rare, but when it does occur I think it has a more profound effect upon the future course of events than almost any other incident. By "decisive" I mean a battle which is fought right out and brought to completion on the spot by the destruction of the larger portion of the enemy's fleet. Such battles were the defeat of the Spanish Armada and Trafalgar, but they are very rare; they occur perhaps not once in one hundred years. The more usual battle when fleets meet at sea are victories of the type of Lord Howe's victory of the 1st June and the Battle of Jutland. In those battles history eventually assigns the victory to one side, but at the time probably both belligerents claim the victory, and it is rather difficult for them to see at the moment exactly what the effect of the battle is going to be. Those are the types of battles which everybody ought to expect in naval warfare because they are the ones which most usually occur. I am afraid they are usually hailed by a chorus of attacks from the public of the day on the Commander-in-Chief—attacks made by people who may have only heard of such battles as the defeat of the Armada and Trafalgar and expect them to occur on every occasion. The reason for this I think is that few people outside our own service really understand the problems with which the admiral is confronted, or the main characteristics of a sea battle.

A battle at sea is I think what you term in military parlance an encounter battle, and under modern conditions is fought at extremely high speed with the fleets engaged over a very wide area; for instance the slowest vessels in these days would approach at any speed up to 40 knots and the fastest destroyers when they are counter-attacking, at a speed of anything up to 70 knots.

Surprise is a very difficult thing to effect at sea. It is almost impossible to conceal the movements and the intentions of the various units. Perhaps the two most important factors in a sea battle may be said to be *time* and *weather*. I think one of the most striking things from naval history is how often the greatest sea commanders have exercised the most extraordinary patience under various circumstances and then suddenly, they have appeared to have thrown prudence to the winds and have proceeded with almost feverish energy to attack without the further loss of a moment. I think that is to be explained by the fact that in a sea battle the psychological effect of the attack—the exactly right timing of the attack is almost of more importance than the actual material gain or loss resulting from it. If this was so in the old days of sailing ships how much more so must it be in these days of high speed and when the inventions of aircraft and submarines have been brought to the stage at which they are. An attack made a moment too soon may be a stroke in the air, and an attack made a moment too late may miss an opportunity which will probably not occur again for many months.

The weather, in spite of modern conditions, may be said to play an enormous part in the fortunes of a sea battle and it is almost as much a cause for thought and trouble to an admiral as the actions of the enemy himself. One is continually fighting against the elements whereas the enemy appears at very infrequent intervals. A change in the weather conditions makes an immense change in the problem with which the admiral is confronted, and although admittedly this change is the same for both sides, the speed with which the admiral grasps or anticipates it makes a very great deal of difference to the immediate situation.

Again, although in battle too much reliance should not be placed upon signals, for they are at any moment liable to be interfered with by the enemy, yet the Commander-in-Chief can, by his own personal movements—the movements of his flagship—by his own personal effort and will, very largely dominate or retrieve a situation in battle.

Another point, which perhaps is not always realized in connection with our problem, is that we are entirely free from anything to do with supply, transport and movements of troops, so that really our staff problem is extremely simple compared to yours. This allows the admiral to exercise a great deal of personal control over his fleet.

The problem presented to the Commander-in-Chief has been most lucidly stated by Nelson who said, "The business of an English Commander-in-Chief is first to bring the enemy's fleet to battle on the most advantageous terms to himself, and secondly to continue them there, without separating, until the business is decided." He goes on in this particular memorandum I am talking about which was issued shortly before Trafalgar, to explain that he first of all will try to get the initiative (and in those days it was done by getting the weather gauge), and then he will throw the whole of his force on an inferior portion of the enemy leaving the remainder in a position where they can take no immediate part in the battle; and thirdly, he will endeavor to pass through their line and engage them from the lee side so that they cannot get away when the battle is beginning to go against them.

In the following October, however, just before the battle he issued an addendum to his memorandum in which he says: "Thinking it almost impossible to bring a fleet of 40 sail of the line into a line of battle in variable winds, thick weather and other circumstances which must occur without such loss of time that the opportunity would probably be lost of bringing the enemy to battle in such a manner as to make the business decisive I have made up my mind," and here follows a modification of his previous instructions which I think might be summed up by saying that he makes up his mind that he will expose his ships during the initial contact to greater risk of damage from the enemy in order to defeat these two factors, time and weather, upon which he lays particular stress.

Of course there is a limit to the risks to which ships can be exposed on initial contact in order that a decisive advantage may be gained later on, and the enemy engaged and defeated in the time available. The fixing of this limit must always be the supreme test in the judgment of the admiral commanding-in-chief. Nelson had behind him the whole of the experience of the sailing ship period, and we have behind us the very short amount of experience since the advent of steam, and the introduction of the torpedo.

I think the above characteristics of a sea battle should be kept in the forefront of one's mind, if the problem is to be understood rightly. I think that the reason why the tactics of a naval battle are very frequently controversial and misunderstood is that these characteristics are not fully grasped. To sum them up: a naval battle is an encounter battle fought at high speed over a large area, the element of surprise is small, time and weather are enormously important and a very large degree of control can be exercised by the commander-in-chief, who does not require a staff or anything like the scale required for a land battle.

I will now sketch our system of fighting instructions and they may be divided into two, those issued by the Admiralty, and those issued by individual commanders-in-chief. The Admiralty issues instructions dealing with the general principles on which a battle is fought and the commander-in-chief issues his standing instructions as to the different tactics he will pursue under different circumstances in the different dispositions of his fleet according to what force is placed under his command. The Admiralty system was one which was evolved over 100 years ago by Howe and Kempenfeldt whose fighting instructions, tactical movements, and all the signals ordering these movements and conveying the admiral's possible intentions, were compressed into one volume, the "Signal Book," and this signal book formed the basis of tactical training for the whole navy.

For the navy of the 19th century was one of peace, and as always happens in periods of prolonged peace administrative and technical details

crept in until the tactical and fighting part became almost submerged in a mass of administration and in the minds of many officers no doubt it was relegated to second place. However, for the last ten years before the war a tremendous effort was made and the fighting instructions were separated and taken out of the signal books. The books themselves were revised but, unfortunately, when war broke out those new books were never actually brought into force, and during the war the instructions on which we acted and on which we fought, on the few occasions when we did fight, were the Grand Fleet battle instructions which were tactical orders built up by the commander-in-chief of the Grand Fleet and which really combined the general principles which used to be issued by the Admiralty and the commander-in-chief's own detailed plans and instructions. They were separated from the signal book and the disadvantage was that the signal book issued by the Admiralty and the instructions issued by the commander-in-chief were not perfectly co-ordinated.

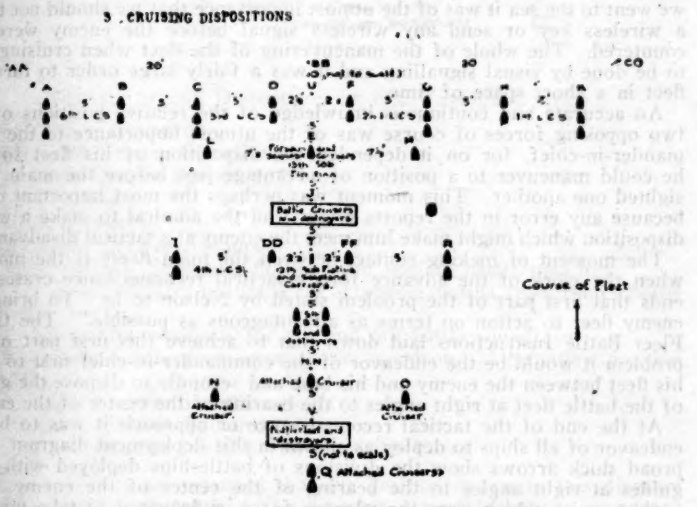
With the dispersion of the fleet at the close of the war we have now reverted to a system of Admiralty instructions dealing with general principles which will form a basis for tactical training of the fleet throughout the service and the commanders-in-chief issue their own particular fighting instructions and plans for the forces under their command. These are separate to the signal books but better staff organization ensures better co-ordination of signals and instructions.

I will now endeavor to give a short outline of how a modern sea battle might be, or probably would be conducted, and for convenience I will divide it into three portions, first the approach, which covers the time from when the advanced forces make contact until the main fleets sight one another. This is the period of reconnaissance when the advance forces have to discover and report the dispositions of the whole of the enemy's fleet and prevent the enemy's advance forces from discovering and reporting the dispositions of our own fleet. The second period is the main fleet action and the third period is "after action" when the result has been achieved.

The fleet when at sea cruises in what is termed a cruising disposition, and these cruising dispositions are diagrams which are made out under various circumstances of cruising. This particular one here is a diagram showing the whole of the Grand Fleet concentrated and in cruising disposition. We have the advanced line of light cruisers disposed about five miles apart and about 35 miles ahead of the battle fleet. This is disposed in units of two or three ships. They are shown in this diagram as in line ahead, but in actual practice they are in a much looser formation; they really are spread almost in one continuous line as a look-out screen for the battle fleet. Positions 10 miles further ahead are provided for airships or aircraft, and for an air screen at visibility distance ahead of the light cruiser screen. Immediately astern of the centre of the screen at the point "U" we have the aircraft carriers. These carried the reconnaissance air screen; they kept an air screen out head of the light cruiser screen and on the enemy being reported it was the function of those aircraft carriers to despatch further aircraft to look out for and discover the enemy. These positions O. M. J. are the positions of the cruiser supports; two very fast specially built cruisers at O and M whilst J was the place where the battle cruisers were stationed with their accompanying destroyers. The function of the supports was to move up to repel any of the enemy's cruisers who pierced our screen, and the function of the light cruisers was to go on and to endeavor to outflank the enemy's screen and to locate and report the enemy's battle fleet. The advanced light cruiser line, their supports, and attendant aircraft carriers comprised the battle cruiser force. They were not always in station with the Grand fleet as shown; they were very often employed scouting at considerable distances. Astern of the battle cruisers is the reserve screen; any vessel of the enemy which succeeded in piercing or evading the battle cruiser force still has to meet this reserve screen of light cruisers. Two submarine flotillas usually accompanied the fleet; they were vessels of the *K* class (of which one has just been sunk)

and they had a surface speed which enabled them to keep with the fleet. Their function was, as soon as the enemy's fleet was discovered, to endeavor to get into a position between the enemy's fleet and his base. They acted independently from the time the enemy's main battle fleet were reported. Astern of the reserve screen is the fast battle squadron which acted as supports to *this* reserve light-cruiser line. Next astern are the linking ships; they pass out visional signals and finally there is the battle fleet, consisting of about 36 battleships and about 100 attendant destroyers.

The method of reporting the enemy as soon as contact is obtained is very rigidly laid down. The report consists of the class of vessels sighted, the numbers, the bearing and distance of the enemy, the course of the enemy, the position of the reporting ship and the time at which the report is sent off. That is a very short signal; it consists of one six-letter group, one position group, which is partly figures and partly letters and a time



CRUISING DISPOSITION NO. 1.—ADVANCING.

(Battle Cruiser Force Present.)

NOTES.—(i) Positions "O" and "N" are 67° from right and ahead 6 miles from the leading ship of the center column of the battle fleet.

(ii) If the 5th B. S. is stationed with the main fleet, the 5th B. S. attached cruiser is to move towards "S" to maintain visual touch with the line I R and a ship of the fourth L. C. S. is also to be dropped back if necessary.

(iii) The commander-in-chief may order the 4th light-cruiser squadron to reinforce the line A K in which case the admiral commanding light cruiser force is to give directions as to the positions on the line to be occupied informing the commander-in-chief.

(iv) *Courageous, Furious,* and *Glorious* are to be kept in visual touch by day.

(v) By night the columns of the battle fleet and battle-cruisers and the screening destroyers will be disposed as requisite.

The attached cruisers at "N" and "O" are unless otherwise ordered to take station ahead of their respective battle squadrons.

group. These enemy reports, when sent off by wireless by these ships are received by all commanders of units and individual ships, the wireless organization providing for this, and they are plotted on a board. This plot is not only a matter of placing on the board the position of all enemy craft reported. The plot to be of value has to show the relative position as regards the opposing fleets at any moment. To achieve this the track of both fleets must be plotted continuously, our own fleet according to the reckoning and the enemy from all available data obtainable from all cruisers and from aircraft or from shore directional stations, or any other source. Shore wireless stations listened for any wireless signal made by the enemy and took bearings of it and passed out the result. Also certain ships in the fleet were fitted with directional wireless and they could get a fairly accurate fix of the position of the enemy.

One of the factors governing the cruising disposition used to be that every unit had to be within sight of its next outer ship or unit because when we went to the sea it was of the utmost importance that we should not touch a wireless key or send any wireless signal before the enemy were encountered. The whole of the maneuvering of the fleet when cruising had to be done by visual signalling and it was a fairly large order to turn the fleet in a short space of time.

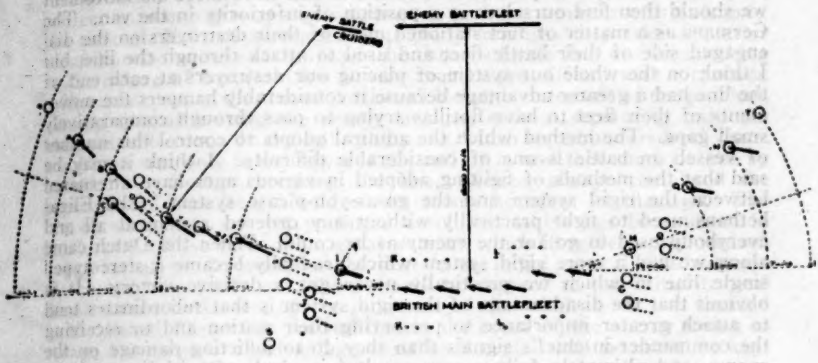
An accurate and continuous knowledge of the relative positions of the two opposing forces of course was of the utmost importance to the commander-in-chief, for on it depended the disposition of his fleet so that he could maneuver to a position of advantage just before the main fleets sighted one another. This moment was perhaps the most important of all because any error in the reports might lead the admiral to make a wrong disposition which might make him meet the enemy at a tactical disadvantage.

The moment of making contact between the main fleets is the moment when the work of the advance force's tactical reconnaissance ceases and ends that first part of the problem stated by Nelson to be "To bring the enemy fleet to action on terms as advantageous as possible." The Grand Fleet Battle Instructions laid down that to achieve this first part of the problem it would be the endeavor of the commander-in-chief first to place his fleet between the enemy and his base and secondly to dispose the guides of the battle fleet at right angles to the bearing of the center of the enemy.

At the end of the tactical reconnaissance or approach it was to be the endeavor of all ships to deploy as shown in this deployment diagram. The broad thick arrows show the divisions of battleships deployed with their guides at right angles to the bearing of the center of the enemy. The various units, which were the advance force, endeavored to take up their stations as arranged, always keeping contact with the enemy as they come in and ready to join in the fleet action at the moment when the two main fleets come into contact with one another. The battle cruisers in battle were to engage the enemy's battle cruisers and to prevent them from interfering in any manner with the attack of our torpedo craft. The function of the light cruiser squadron is first of all to prevent the enemy's destroyers, which are not shown on the diagram, from interfering with, or making their attack on our own battle fleet and also to clear the way for our destroyers to make their torpedo attack on the enemy. Directly the main fleets made contact those destroyers moved out in succession preceded by these light cruiser squadrons which you will see stationed right ahead of them. The unit of attack for destroyer flotillas is that they move out by flotillas but their actual handling is by half flotillas. The first half flotilla's function is to deal with any of the enemy's destroyers with which the light cruiser squadrons have failed to deal, while the second half makes its attack with torpedoes. At the same time if they do not meet with opposition both the light cruisers and the first half flotilla fire their torpedoes at the enemy as soon as they get in a position to do so.

The ideal position for everybody to attain is of course in the van. That is the position from which they can most conveniently attack the enemy's battle fleet but we have to station a certain proportion of vessels astern

DIAGRAM SHOWING THE ORDER OF THE FLEET AFTER DEPLOYMENT.



DETAILS OF THE DISPOSITION OF THE VARIOUS UNITS.

A, 1st Cruiser Squadron.
B, 6th Light Cruiser Squadron.
C, 3d Light Cruiser Squadron.
D, 13th Flotilla.
E, Battle Cruisers.
F, 4th Light Cruiser Squadron.
H, 15th Flotilla. Screening flotilla from leading battle squadron.
J, *K*, *L*, *G*, Alternative positions for screening flotilla from center battle squadron.
I, *M*, Alternative positions for 5th and 6th battle squadrons.
O, Screening flotilla from rear battle squadron. Alternative position for flotilla.
Q, 2d Light Cruiser Squadron.
N, 1st Light Cruiser Squadron.
R, *S*, *T*, Alternative positions for Harwich Force.

NOTE.—(1) It is not intended that the position shown in this diagram should be rigidly adhered to. The diagram is a guide only to squadrons and flotillas taking up their positions on deployment.

To avoid congestion at the van the distances shown for the leading battle squadron should generally be regarded as a minimum.

The direction in which the main action will be fought may differ from that of the initial direction of the deployment, and it may therefore be desirable to order detached units to take up their battle stations with a view to the strength being mainly in the van on the course the commander-in-chief considers will be that on which the action will eventually be fought, although the first deployment may be in the opposite direction.

Battle cruisers, 4th Light Cruiser Squadron and destroyers may therefore be ordered to take up their battle-stations on the port or starboard flank of the original line of advance of the fleet. They are to remain on this flank, unless special orders to the contrary are received even though the initial direction of deployment may be towards the opposite flank. The light cruiser squadron on the advanced line during the approach will remain on their respective flanks, two squadrons being at the van and two at the rear of the fleet for all directions of deployment.

of the fleet because the enemy may at any moment reverse his course and endeavor to escape, and if we reversed our course to meet his movement we should then find ourselves in a position of inferiority in the van. The Germans as a matter of fact stationed most of their destroyers on the disengaged side of their battle fleet and used to attack through the line, but I think on the whole our system of placing our destroyers at each end of the line had a greater advantage because it considerably hampers the movements of their fleet to have flotillas trying to pass through comparatively small gaps. The method which the admiral adopts to control this number of vessels in battle is one of considerable difficulty. I think it may be said that the methods of fighting adopted in various ages have alternated between the rigid system and the go-as-you-please system. The Elizabethans used to fight practically without any ordered system at all and everybody used to go for the enemy as he could. When the Dutch came along we had a more rigid system which gradually became a stereotyped single line in which we practically never got a decisive victory. It is obvious that the disadvantage of the rigid system is that subordinates tend to attach greater importance to preserving their station and to receiving the commander-in-chief's signals than they do to inflicting damage on the enemy, and ultimately failure may result from lack of initiative and the inability to secure a favorable opportunity when it arises. Of course the disadvantage of too much freedom is lack of co-operation. So we had to devise some system between the two and the system adopted in the Grand fleet in the war was that each unit was handled separately by its flag officer. Units were a division of battleships consisting of from four to five battleships, a squadron of light cruisers of anything between four and eight—there are generally about six—a flotilla of destroyers numbering about 20 and a flotilla of submarines about six to eight. The system adopted was that units were handled independently as occasion dictated and commanders had full power to initiate the movement of their units, conforming generally to the movements of the commander-in-chief. The commander-in-chief who was stationed in the center of the battle fleet controlled simply the division in which his flagship was stationed, but notwithstanding that decentralization of command he retained the power to order the movement of the whole fleet by executive signal, should he consider that it was necessary to ensure decisive results; for instance, supposing he had been successful in placing his fleet between the enemy and his base, and the enemy endeavored to escape by putting down a smoke screen, reversing his course and escaping under the stern of our fleet, it would then be necessary, for the commander-in-chief to reverse the course of his fleet to prevent him doing so.

The distribution of gun fire of the fleet was a matter in which considerable difficulty was experienced. It was found in the war that even if the commander-in-chief managed to maneuver so as to get into a position of tactical advantage it was extremely difficult for the gunnery people to reap the benefits of that tactical advantage because they were unable to select the right target and to concentrate their fire effectively. So a system was evolved whereby the commander-in-chief signalled the bearing of his flagship's target, and according to pre-arranged principles and the situation of the enemy which the commanders of each unit visualized from the plot, each unit could calculate the sector in which their targets lay and this provided them with the necessary information to obtain the desired concentration.

We are now able effectively to concentrate four ships on one, whereas at the beginning of the war it is very doubtful whether the fire of two ships on one was very much more effective than single ship to single ship. Now I think you can say that the fire of two ships is certainly twice as effective as one, and probably the fire of four ships is very nearly four times as effective as the fire of one ship.

With regard to torpedo attack, each unit of the fleet endeavors to effect a torpedo concentration on that portion of the enemy which is most suitably

placed to receive torpedo attack. Of course the difficulty of effecting a concentration of torpedo fire is the very long time of flight; whereas the projectile from a gun at a given range is perhaps a matter of 15 seconds, the time of flight of a torpedo is as many minutes—they take a quarter of an hour to 20 minutes to reach the enemy's battle line so that anything in the nature of concentration is very much more difficult with torpedoes.

We now come to the second portion of Nelson's statement of the problem, namely that of keeping the enemy engaged without separating until the business is decided. In the sailing ship era, which lasted hundreds of years, a solution was only found towards the end of it, and then more or less by accident, by Rodney breaking the line. Nelson always completed the business and once he got hold of the enemy he never let them go. The era of steam has not yet produced a solution which has been tested in battle. Of course there are a great number which have been produced on paper but all of them expose the fleet to an initial tactical disadvantage. Of course how much your ships should be exposed to this initial tactical disadvantage is the test of the judgment of the admiral. It was decided in the Grand Fleet after Jutland that in the event of the enemy trying to escape the torpedo disadvantage must be accepted and he must be kept under gun fire. We put our money on the gun; the enemy put his money on the torpedo.

Another possible solution is to divide your fleet and place one-half of your fleet on this side of the enemy and the other half on the other side but, of course, the difficulties of that are very great. One part of your force may be overwhelmed before the other force comes into action. Another possible solution is to get to such close range that it does not matter which way the enemy turns, but, of course, the difficulty is to get there when the enemy can easily keep you at long range by putting his helm over, and sheering off. It is extremely difficult to close with the enemy if he does this as each time he turns away time is lost in turning to follow him.

After the main fleet action has taken place there is very little more except that we had an organization for reorganizing all ships which still retained their tactical speed and had sufficient ammunition and torpedoes to take up the pursuit relentlessly. As soon as the enemy's order was broken and he was defeated it was the organization for ships to re-form, and without loss of time to pursue and, in the words of the instructions, it was the duty of all ships to "locate and report" and to "attack and destroy" the disorganized fleet.—*The Journal of the Royal Artillery*, April, 1921.

JAPAN

TURCO-JAPANESE RELATIONS.—A new departure for Japan is the appointment of a high commissioner at Constantinople in the person of Mr. Sadatsuchi Uchida, formerly Japan's minister at Stockholm, and the fact that his mission is not a temporary one decides the semi-official Paris *Temps* to infer that it is Japan's intention to fix an embassy at Constantinople as soon as peace is officially established between Turkey and the Allies. Then the high commissioner will become ambassador, and this well-informed Paris daily avers that those who know the prudence and the tenacity of Japanese diplomacy do not for an instant think that he will be a mere figurehead. He will be not only an observer in this capital of the Near East, where Japan has never before had any diplomatic representative, but he will be a pioneer, because Japan desires to conclude a commercial treaty with Turkey, and we read:

"He will pursue a certain policy, of course, because Japan is interested in the independence of Turkey and naturally has no pretensions to Turkish territory. Altho we do not know the circumstances in which the Japanese government decided to send a representative to follow the course we have outlined, we may well consider that Japan did not take action without having notified her ally, England. Moreover, Japan wishes to keep an eye

on Russia, where the Soviet government is taking up the tradition of the czars, and looking longingly toward Constantinople.

"By installing a diplomatic envoy in the capital of the Sultan, and by appearing to the Turks as the defender of their independence, Japan reminds everybody that with its 77,000,000 of population, with its army intact and its constantly growing fleet, it is the greatest power of Asia. Unless we are in error, it is pursuing the policy that has already led it to conclude an agreement with the Emir of Afghanistan. What is more, the Treaty of Sèvres provided that Japan would have a delegate on the Straits Commission, empowered with two votes, even as England, France, and Italy. It will be recalled also that the United States was to have two votes on this commission 'from the time it wished to participate, in case it should wish to participate'; and that the same treatment was promised Russia 'if it became, and on the day it became, a member of the League of Nations.' Turkey, like Greece, Roumania, and Bulgaria, was to have only one vote."

The arrival of the Japanese High Commissioner may prove to be a real advantage for Turkey, in the view of *Le Temps*, which admits that the independence and the future frontiers of the Sultan's state depend not so much on diplomatic conversations at Constantinople as on the shot and shell exchanged between the Nationalist Army of Angora and the army of King Constantine. But if the Greeks are finally vanquished, it is predicted that diplomatic arrangements will be helpful to the Turks toward a complete exploitation of their victory.—*The Literary Digest*, May 7, 1921.

DISARMAMENT IMPETUS IN JAPAN.—The cry for disarmament is beginning to penetrate "even Japan," it is noted by those who are impressed with the continuous reference to the subject in various Japanese newspapers of importance. Even some politicians have taken it up, although at the loss of a certain amount of their popularity, we are told. *The Japan Magazine* (Tokyo) is sufficiently moved by the views of Marquis Shigenobu Okuma, as set down in the Japanese *Taikwan*, to condense them for the benefit of readers of English, and it emphasizes the fact that this distinguished elder statesman is "not prepared to favor unconditional disarmament so heartily as other advocates seem to do, but bases his hope that Japan will adopt this policy upon the supposition that England and America will lead the way, as the two nations most vitally concerned." Before the war there were eight great powers, the Marquis Okuma reminds us, and three of them were naval powers—England, Germany, and America. Germany, Austria, and Russia are now in "a desperate or at least struggling position," and the two great naval nations are England and America. If the world sincerely desires peace let the strongest nations make the first move, the Marquis suggests, for if the weaker nations were to initiate such a movement it would be "tantamount to unconditional surrender," and he continues:

"To be sure the weaker nation can use its armaments only as a threat, but being so weak it can not disregard armaments altogether. The nation which has greater defences cannot demand that the weaker nation disarm first. If the strong have no aggressive designs, they do not need so powerful a fleet for defence merely. That Japan and Italy have no aggressive designs is proved by the weakness of their respective fleets. To be sure, Japan's 8-8 program may sound big, but compared with England and America, it is not even one-half as large. Hence, Japan has only the minimum, and can not begin to reduce. By all means let England and America begin. That will be the one short method of securing world-peace, and Japan will delightedly welcome such an arrangement.

"No one can deny the fact that the world is spending immense sums on armaments and is feeling severe financial embarrassment on account of this enormous expenditure. At a time when the nations are suffering serious financial depression after a war extending through nearly five consecutive years, and when provision for the national defence can hardly be made even with the utmost effort, how does Japan feel about this

matter? We are, indeed, not strong either financially or economically, yet we cannot neglect our national defences even for a day, since we are as dependent upon these for existence as a bird upon beak and spurs or an animal upon teeth and claws. . . . .

"If the great powers could mutually agree to reduce their armies and navies it would, indeed, be a blessed thing for Japan as well as for this war-weary world. Merely from the financial relief alone, Japan would sing for joy. And, in closing I would repeat once more that, as the usual order of procedure is for aggression to come from the stronger upon the weaker, we are looking for America and England to set our hearts at ease by taking the initiative in disarmament and giving a good example to the world in this regard. As the first gleam of light I look to see England and America negotiate this question successfully, after which I trust France, Japan, and Italy will follow suit."—*The Literary Digest*, May 7, 1921.

IS THE ANGLO-JAPANESE PACT DEAD?—If it is not dead, the Anglo-Japanese Alliance is moribund, say some sharp Japanese critics, and ought to be allowed to die in peace. But altho the former reasons for it have ceased to exist, we hear from some British sources, new ones have come up that make a Far-East understanding between Britain and Japan of high importance, especially because of certain pro-American possibilities in China. Among the Japanese press the Tokyo *Kokumin* says that "if the object is to preserve the Anglo-Japanese Alliance as a historic monument or something like an object of art in view of the services it has rendered in the past, we have no objection," and it adds:

"Under the Alliance Great Britain fulfilled her obligation in the Russo-Japanese War, while Japan's obligation was discharged in the world war. Unless Japan asumes the duty of protecting India and Great Britain undertakes the task of guaranteeing the Pacific, there is no value in the Anglo-Japanese Alliance."

In the view of *The Herald of Asia* the first obvious inconvenience ensuing from the renewal of the Alliance would be the suspicion created among Americans that it is "ultimately directed against them." The relations between Great Britain and the United States, we are told, are no longer as cordial as a few years ago. This journal does not believe that Anglo-American rivalry, however sharp it may become, and "it will undoubtedly become dangerously bitter," will ever precipitate an armed conflict between the two nations. In any case, however loudly the British Government may shout its friendship for America, the renewal of the Alliance with Japan is "bound to excite an unfortunate suspicion in America as to the real intentions of the signatory powers."

The Round Table (London), a quarterly review of the politics of the British Commonwealth, believes that the fundamental interests of the British Empire in the Far East to-day are the same as they were ten years ago, namely, peace and security for British territory, good relations with all Far-Eastern Powers, the open door for trade with China, and the establishment of a capable and progressive government in China itself. On the latter point *The Round Table* observes:

"In the first place, there must be a clear understanding between the British Empire and Japan that Japan really wishes to establish a stable and independent government in China and is willing to live up to the principle of the 'open door' for the trade and commerce of all nations within it. That Japan will always have a predominant position in China is certain. Her geographical position insures this, provided that her policy toward China is benevolent and not rapacious. Nobody grudges her a position of exceptional authority and influence in China, but other nations could not acquiesce in her claiming for herself any exclusive privileges, and still less in her attempting to establish any direct or indirect authority over Chinese affairs."

The second condition necessary to the renewal of the Alliance, according to *The Round Table*, is that it should not lead to misunderstandings with other powers, and it is pointed out that:

"The real danger of renewal is that it may lead to a counter-balancing combination between China and the United States. Nothing could be worse for the future of the British Empire or Japan than that they should drift into a position in which they were placed in opposition to the United States and China. So long as both Great Britain and Japan loyally live up to the principles which originally underlay the Anglo-Japanese Alliance, and the Government of Japan sets its face resolutely against the policy represented by the twenty-one demands, there is nothing in the Alliance which is hostile either to the interests of the United States or of China. But the negotiation of an alliance between two powers which cannot fail to affect the interests and the future of its neighbors is bound to arouse suspicion, and possibly hostility, unless it is done with their knowledge and consent."—*The Literary Digest*, Apr. 16, 1921.

OUR YAP PROTEST AS SEEN IN JAPAN.—A conciliatory attitude toward the American protest about Japan's mandate for the island of Yap is observed in some sections of the Japanese press, but in others the fear is expressed that "whether Japan yields an inch America takes a yard," and a rallying-cry is heard that Japan "stand fast," especially as America has no right to protest about anything covered by the Versailles Treaty, since she has failed to ratify it. Meanwhile, it is understood, say Tokyo dispatches, that Japan is consulting with Great Britain and France on the subject; and France, we learn from Washington dispatches, favors the American principle of equality of rights in mandatary territories advanced in the Hughes note to the four great powers associated with the United States in the war. In Premier Briand's reply to the Hughes note he points out that since it was sent simultaneously to the governments of Great Britain, Italy, and Japan, "it cannot be answered until after an understanding has been reached between the governments of the four interested powers at the time of the next meeting of the Supreme Council of the Allies." Mr. Briand adds, however, that he would "inform Your Excellency at once that when this question comes before the Supreme Council the representatives of France will broach the examination thereof with the greatest desire to find a solution which will give every satisfaction to the United States." The Tokyo *Chugai Shogyo* declares sharply that "if America insists on the internationalization of Yap, she will lay herself open to the charge that her intention is to snatch the island from another country in order to possess herself of it," and it asks:

"Is such an attitude consistent with the idea of justice and humanity which has been so loudly preached by America? The mandates for the South Pacific islands were decided upon on May 7, 1919, at a conference of Great Britain, America, France, and Italy. At that time the decision was entirely approved by Mr. Wilson. Yet America now objects to Japan's occupation of the island in question. Not only is this attitude of America improper, but it is difficult to understand her real intentions."

This Japanese paper is subject to correction on this point, it is noted by some, as may be gathered from a statement in Premier Briand's communication to Secretary of State Hughes, in which we read:

"By a note dated February 18, after having noted that the decision of May 7, 1919, made no reservation concerning the mandate attributed to Japan over the islands of the northern Pacific, my department pointed out to your embassy that nevertheless President Wilson and Mr. Lansing had formulated in the course of a former meeting in the presence of the representative of Japan categorical reservations concerning the island of Yap, that Baron Makino had not objected, that the question raised by the representatives of the United States should be placed in discussion, and that consequently the Japanese Government was cognizant of the

American reservations. The note concluded that thus there were elements for a resumption of conversations between the United States and Japan which the Government of the [French] Republic would be happy to see result in a satisfactory conclusion."

The Tokyo *Yorodzu* says bluntly that America's "threat," that if Japan does not agree to American claims regarding Yap, America will not recognize the Japanese mandatary rule of the island, is "insolent," and it asserts that as America has not ratified the Versailles Treaty "she has consequently no right of veto over its stipulations." The Tokyo *Hochi* charges that America "aims at the internationalization of Yap," and with that objective protests against Japan having the mandate, and therefore tries to prevent the cables from being monopolized by Japan. As the will of America is "uncompromising, there should be no optimism regarding the future of the problem," yet:

"If the question involved is only one of the disposal of the cables, the settlement will be comparatively easy, as is the case with the Atlantic cables, but the fundamental object of America is to internationalize Yap. If this American claim should be entertained, there would be no use in Japan's acquiring a few cables. We cannot but hope that the government will go to the root of the matter and see to it that an adequate settlement is made."

In contrast to the foregoing, other journals such as the Tokyo *Jiji-shimpo*, the *Asahi*, and the *Yomiuri* counsel moderation and cable concessions within bounds, and the *Yominuri* considers that the United States is justified "at least in protesting concerning the mandate, which is in the interest of harmony with Japan," but "should Japan abandon the mandates, she should ask the United States to abandon the fortifying of Guam."—*The Literary Digest*, Apr. 30, 1921.

SHIPBUILDING IN JAPAN.—Some remarkable facts relating to the expansion of the Japanese shipbuilding industry since 1914 have recently been published. Seven years ago the number of yards in Japan which were able to build ships of more than 1000 tons was limited to four. By 1918 this number had risen to 45. From 1916 onward the output of tonnage rose by leaps and bounds in response to the demand created by the war. The total output for 1916 came to 185,000 tons as compared with a maximum of 40,000 tons before the war. In 1917 vessels aggregating 486,000 tons were put afloat, and in the following year no less than 721,000 tons were launched. Following the armistice a decline set in, but in spite of this the Japanese yards produced 675,000 tons in 1919. The slump made itself felt more severely last year, the total for which was only 456,000 tons. Owing to the world-wide depression in the shipping industry many Japanese establishments are finding it difficult to carry on, and unless conditions improve it is expected that the number of yards will have been reduced to 17 or 18 by the end of the year. Some relief has been afforded by the large naval program introduced last year. As the Japanese Naval Attaché pointed out to one of our representatives not long since, with so many of the native yards clamoring for work it is most unlikely that the government will consider the placing of naval contracts abroad, and the prospect of foreign shipbuilders enjoying any share of the work is therefore remote. Furthermore, it is understood that during the debates on the new navy budget the government virtually pledged itself not to go outside Japan for any material which could be fabricated by native industry. As Japan already possesses the distinction of spending a higher percentage of her revenue on armaments than any other nation, it is only natural that her people should desire to keep the money in their own country. According to Mr. Ozaki, a prominent member of the Diet, the current naval and military budgets will absorb no less than 32 per cent of the total revenue.—*The Naval and Military Record*, Mar. 30, 1921.

UNITED STATES

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION, AS REPORTED APRIL 30, 1921

Type, number and name	Contractor	Per cent of completion			
		May 1, 1921		Apr. 1, 1921	
		Total	On ship	Total	On ship
Battleships (BB)					
44 California	Mare Island Navy Yard	96.5	96.3	96.1	95.7
45 Colorado	New York S. B. Cpn.	71.3	69.4	69.3	66.2
46 Maryland	Newport News S. B. & D. D. Co.	98.3	97.8	96.8	96.2
47 Washington	New York S. B. Cpn.	63.1	56.3	61.2	54.3
48 West Virginia	Newport News S. B. & D. D. Co.	52.1	42.4	49.5	39.3
49 South Dakota	New York Navy Yard	29.1	21.1	26.7	18.1
50 Indiana	New York Navy Yard	25.8	17.8	23.1	14.8
51 Montana	Mare Island Navy Yard	22.1	13.2	18.	11.9
52 North Carolina	Norfolk Navy Yard	29.4	21.	27.4	19.8
53 Iowa	Newport News S. B. & D. D. Co.	19.3	15.4	16.1	12.6
*54 Massachusetts	Beth. S. B. Cpn. (Fore River)	3.	.5	2.5	....
Battle Cruisers (CC)					
1 Lexington	Beth. S. B. Cpn. (Fore River)	16.6	6.5	13.8	4.
2 Constellation	Newport News S. B. & D. D. Co.	9.3	6.3	7.9	4.8
3 Saratoga	New York S. B. Cpn.	20.4	11.8	18.1	9.5
4 Ranger	Newport News S. B. & D. D. Co.	1.6	.7	1.2	.6
5 Constitution	Philadelphia Navy Yard	6.	2.9	4.3	2.
6 United States	Philadelphia Navy Yard	6.	2.9	4.3	2.
Scout Cruisers (Light Cruisers CL)					
4 Omaha	Todd D. D. & Const. Cpn.	91.4	82.7	90.	81.8
5 Milwaukee	Todd D. D. & Const. Cpn.	88.3	79.7	84.7	78.9
6 Cincinnati	Todd D. D. & Const. Cpn.	80.6	68.9	80.6	65.4
7 Raleigh	Beth. S. B. Cpn. (Fore River)	53.8	35.2	51.4	33.3
8 Detroit	Beth. S. B. Cpn. (Fore River)	53.6	35.	51.2	33.1
9 Richmond	Wm. Cramp & Sons Co.	64.	38.	62.	....
10 Concord	Wm. Cramp & Sons Co.	62.	36.	60.	....
11 Trenton	Wm. Cramp & Sons Co.	44.	22.	41.	....
12 Marblehead	Wm. Cramp & Sons Co.	42.	20.	39.	....
13 Memphis	Wm. Cramp & Sons Co.	35.	14.	32.	....
Auxiliaries					
Fuel Ship No. 18, Pecos	Boston Navy Yard (Oiler AO 6)	82.5	81.6	75.5	73.8
Ammunition Ship No. 2, Nitro (AE 2)	Puget Sound Navy Yard Com	m. 4/	1/21	99.9	99.8
Repair Ship No. 1, Medusa (AR 1)	Puget Sound Navy Yard	60.6	44.5	58.	40.3
Dest. Tender No. 3, Dobbin (AD 3)	Philadelphia Navy Yard	57.3	57.	52.3	52.
Dest. Tender No. 4, Whitney (AD 4)	Boston Navy Yard	21.	12.5	19.5	7.6
Sub. Tender No. 3, Holland (AS 3)	Puget Sound Navy Yard	16.8	1.4	14.	....
Aircraft Tender, Wright (AZ 1)	Tietjen & Lang	70.	57.	....	....
Patrol Vessels					
Gunboat No. 22, Tulsa (PG 22)	Charleston Navy Yard	64.6	44.7	59.8	41.8

* Battleship No. 54—Keel laid 4/4/21.

In addition there are under construction 8 destroyers and 37 submarines. There were delivered during April, 1921, 7 destroyers.

Authorized but not under construction or contract 12 destroyers, 1 transport and 7 submarines.

THE BATTLESHIP AND THE JUNK HEAP.—Our British cousins are between the devil and the deep blue sea over the question of scrapping their great battleships and preparing for future wars in the air or under the sea. Its lines of communication are so vital to the British Empire that the discussion of the merits and demerits of the battleship have naturally aroused much interest in England.

The heat of the discussion has been felt in America. Our Navy Department has become so much interested that high ranking naval officers have been called upon to testify before the Naval Committees of Congress, and the Naval General Board have made a report on the subject.

The meat of the argument seems to be this: Friends of the all-big-gun-ship maintain that it is still the backbone of the fleet, and that, while the battle line needs numerous auxiliaries to protect it—such as battle-cruisers, light cruisers, destroyers and aircraft—the gun is still the principal weapon in sea warfare. The enemies of the big ship claim that the battleship is doomed—that with the same amount of money spent on submarines, torpedo-planes and bombers, the inordinately expensive dreadnought will be driven from the seas.

In the discussion on the other side of the Atlantic all hands, including even the opponents of the battleship, are agreed that the capital ships of the Grand Fleet, notwithstanding the fact that they were many miles from Dover Straits, made possible an uninterrupted line of men and supplies to war-stricken France, in default of which there is no doubt that Germany would have won the war.

Ordinarily the armed forces of progressive powers profit by the lessons learned in past wars, and the main lessons from the Great World War seem to indicate plainly the gun as still the controlling factor as far as capital ships are concerned.

Thus, British capital ships destroyed, or badly damaged during the war were as follows:

(1)	By gunfire in fleet action	3
(2)	By torpedoes in fleet action	1
(3)	By mine	5
(4)	By submarines	5
(5)	By internal explosion	2
(6)	By torpedoes or bombs from aircraft	0

Now of the five ships that were victims of mines, two were lost at the Dardanelles where they were sent over the protest of the ranking naval officer at the British Admiralty, who knew it was contrary to a well-recognized principle of naval warfare that ships cannot be used against shore fortifications, nor can they be used in confined spaces where mine-laying submarines have an opportunity to "lay their eggs." The other three were lost early in the war, before the paravane was perfected. If, therefore, the lessons of the last war are taken to heart, the mine should play a smaller part against the big ships in the future.

Of the five capital ships sunk by submarines two were at the Dardanelles, confined, in a sense, to a small area, thus offering the slow submerged craft an opportunity to attack them. The other three battleships were torpedoed near Malta, in the English Channel, and near Gibraltar, respectively; it is not known whether they were screened by anti-submarine craft when torpedoed, but it is known that *no* capital ships, cruising in fleet with a proper fleet screen, were lost.

No remarks need be made concerning the two ships lost by internal explosion—the answer to that is a more stable, more carefully made powder.

Taking out the five battleships lost by mines, the five lost by submarines, and the two by internal explosion, on the ground that a more expert knowledge of naval warfare should prevent these losses in the future, it can be easily seen that the war lessons point to the gun as the main factor of sea power.

In any study of the question as to whether the big-gun ship is obsolete, attack on it from three planes must be considered: *i. e.*, surface attack, underwater attack and attack from the air.

1. *Surface Attack.*—Students of naval affairs will remember that with the advent of the modern torpedo boat in the nineties, the disappearance of the battleship was predicted. Progress answered, however, with the destroyer to drive off the torpedo-boat, and this was followed in turn by the fast cruiser to take care of the destroyer, and by the battle-cruiser to protect the van and the rear of the battle line from the cruiser. The normal fleet then settled down to battleships, battle-cruisers, light cruisers and destroyers, and the fleet that could throw the most metal and hit with it, was the one that could win.

2. *Underwater Attack.*—Next came the submarine which some prophets say will play the main rôle in control of the sea in the future. Now, looking again to the lessons learned in the war, not one capital ship in a properly screened fleet was damaged by a torpedo from a submarine during the whole course of the war. One attack was made on the British fleet by Wedigen, universally admitted to the best man the Germans had at the time, but the submarine was rammed and sunk and the capital ships suffered no damage.

The submarine is merely a weapon of opportunity. If it happens to be ahead of a fleet, on its track, and is commanded by an iron-nerved skipper like Wedigen, then it may come within range and take its toll. If the sub is off the track of the fleet, however, its slow submerged speed, while running silently, will not permit it to gain attacking position. If the submarine speeds up, the listening devices in the fleet screen will hear and warn the fleet, and all that the big ships need to do is to avoid that locality. Meanwhile the probabilities are that the fleet screen will get the submarine.

3. *Attack from the Air.*—The other plane from which the dreadnought is to be destroyed is above water. Here the form of attack is to be by torpedoes or bombs launched from airplanes. This was never tried in the World War. It is reported that, recently, in England, a torpedo attack from airplane was made on a squadron of battleships. Five out of eight of the ships were hit with collapsible-head torpedoes. The fleet was at anchor and there was no battleship screen of destroyers firing at the planes which launched the torpedoes. The fleet was not underway so that individual ships would have a chance, by a touch of the helm, to avoid the torpedoes seen in the water, as was done at Jutland.

We must bear in mind that in an airplane attack on a fleet with torpedoes, there are several difficult conditions to be met: (1) The plane must be only a short distance from the water; if too high the tail of the torpedo, carrying the delicate Obry gear, will be smashed and the torpedo will not run true; (2) the plane must be pointed in the right direction to hit the target; (3) the plane must be at a certain definite angle to the water or the torpedo will go to the bottom; (4) the fighting planes from the fleet will be attacking the torpedo planes, and (5) *most important of all*, the secondary batteries of the fleet and improved destroyer anti-aircraft guns will be firing at the attacking airplanes all the time during which they are attempting to fulfill the exacting conditions noted above.

It may well be that progress in aircraft and submarine design will keep an enemy battle fleet further from one's own coast but, after all, in any except a European war, the sea power—which I hold to be the guns of the fleet—must be sent to the vital strategic area in order to bring its influence to bear in ending the war.

Now if the Briton is to control from the air, he must be able to send his airplane torpedoes to the vital sea area. In the present stage of development he must send them in ships, and all an enemy sea power needs to do is to find some means to destroy the airplane-carrying ships. That should be easy.

In the rapid development of all kinds of weapons of war the world has done wonders in the past half century. In this development every nation has been forced to meet type with type. If England is to be considered America's most probable enemy (which God forbid); if she goes heavily into construction of airplane carriers and relies solely on war in the air, then we must meet her, not only by some weapon to destroy her airplane carriers, but by war in the air. If some other nation holds fast to the battleship we must meet her by power on the surface. Again, if any nation, whose policies clash with ours, lays great stress on the submarine, Uncle Sam must be fully prepared to combat the submarine. This has been proved in the past when the torpedo-boat brought forth the design of the destroyer, and the armored cruiser was met by the faster, heavier gunned battle-cruiser.

One of the questions that form the main theme of the writing of the capital ship's principal enemy—Sir Percy Scott—is "What can the battleship do?" The answer comes from one of the underlying principles of sea power. The big gun ship places gun power, the controlling factor of naval strength, in the sea areas where needed. Big-gun superiority forms a point of support for cruisers and other warships and enables them to patrol and control the area in question.—*The Scientific American*, Apr. 16, 1921.

MERCHANT MARINE

SEAMAN GO ON STRIKE.—Owing to the refusal of the representatives of the marine labor organizations to permit any downward readjustment of wages at this time, union seamen on American ships were called out on strike at the beginning of this week when the agreements heretofore in force regarding working hours and rates of pay expired. At the time of this writing, it is impossible to judge how widely the strike order will be obeyed nor to what extent shipping under our flag will be tied up. Negotiations for a settlement are also still in progress which may lead to a speedy and satisfactory adjustment of the present differences.

This insistence of the seamen upon their former scale of wages is largely due to the attitude of the engineers, who have been the chief beneficiaries under the old overtime clause which enabled the seamen to draw considerable extra compensation. According to Admiral Benson, out of the $72,000,000 paid to seamen during the past thirteen months no less than $6,000,000 was due for overtime. Many engineers are reported to have swelled their earnings as much as one-third under this overtime provision, which has tempted them to postpone doing necessary work until such a time as they were no longer on regular watch. With the abolition of overtime, they face a reduction under the new scale of perhaps thirty per cent in their gross income. As the overtime clause has been abused in the past, ship operators are united in endorsing Admiral Benson's stand that payment for overtime services at sea should be for the most part eliminated.

As pointed out by our Washington correspondent, the Shipping Board only determined upon a 15 per cent cut in wages after its experts had ascertained that there had been a fall recently of from 18 to 30 per cent in the cost of living. The wage reduction which the men have been asked to accept cannot, therefore, be deemed unwarranted. In resisting a fair offer and in attempting to delay the inevitable readjustment of wages from war time levels the marine unions have forfeited public sympathy and are engaged in a losing contest. With the exception of the railways, wages in all the great industries of the country have been reduced in accordance with the lowered cost of living. It is no hardship for the laboring classes to accept less pay so long as their purchasing power undergoes no impairment. Workers in shipbuilding and ship repair plants have realized that wages could be reduced without their suffering hardships, and our seamen ought to come to a similiar conclusion.—*The Nautical Gazette*. May 7, 1921.

AERONAUTICS

PRESIDENT HARDING AND AERONAUTICS.—Aviation is inseparable from either the army or the navy, and the government must, in the interests of national defense, encourage its development for military and civil purposes.

The encouragement of the civil development of aeronautics is especially desirable as relieving the government largely of the expense of development, and of maintenance of an industry, now almost entirely borne by the goverment through appropriations for the military, naval and postal air services. The air mail service is an important initial step in the direction of commercial aviation.

It has become a pressing duty of the Federal Government to provide for the regulation of air navigation; otherwise indepedent and conflicting legislation will be enacted by the various states which will hamper the development of aviation. The National Advisory Committee for Aeronautics, in a special report on this subject has recommended the establishment of a Bureau of Aeronautics in the Department of Commerce for the Federal regulation of air navigation, which recommendation ought to have legislative approval.

I recommend the enactment of legislation establishing a Bureau of Aeronautics in the Navy Department to centralize the control of naval activities in aeronautics, and removing the restrictions on the personnel detailed to aviation in the navy.

The army air service should be continued as a coordinate combatant branch of the army, and its existing organization utilized in cooperation with other agencies of the government in the establishment of national trans-continental airways and in cooperation with the states in the establishment of local airdromes and landing fields.—*Flying*, May, 1921.

THE NAVY SHOULD HAVE A BUREAU OF AERONAUTICS.—The activities of the Navy Department are carried on under a system of separate bureaus, each of which is confined to certain specific work. Thus, the Bureau of Construction and Repair designs the hulls of the ships; the Bureau of Steam Engineering designs the motive power; the Bureau of Ordnance designs the guns, and so forth; and each of these is in charge of a director, or chief, who directs and is responsible for the work done in his own particular bureau. This segregation of the multiplied activities of the navy has not been an arbitrary matter; rather, it represents a natural growth in which the institution of separate bureaus has been rendered necessary by the multiplication of inventions and discovery and the ever-increasing complexity of the modern warship. In fact, the bureau system finds its counterpart in that specialization which is such a marked feature of our modern industrial activity, where the growth of each particular branch of industry has been so rapid and has so greatly widened the field of knowledge, that it is all that one man can do to get a thorough mastery of one particular field.

The birth and rapid development of the new art of aeronautics and the important part which it is bound to play in future naval warfare have brought the Navy Department face to face with the question as to whether it must not now create another bureau to deal with what is already a highly specialized branch of naval activity. Even to-day, when we stand merely on the threshold of aeronautical development, the art is sufficiently developed to call for the services of a highly specialized class of men in the designing room, in the work shop, and in actual flying service with the fleet at sea. What we already possess in the way of machines, men and knowledge is merely a beginning, and it is certain that the call for a special bureau will become more insistent as the years pass by.

Three is a powerful movement at work in favor of the institution of a United Air Service, in which the design and construction of machines and the training of officers will be done under a single central body, and the machines and the men allocated to the army or the navy in response to the

demand. Personally, we believe that the army service on land and naval service at sea are so widely different. both in the character of the machines required and in the training of the personnel, that no greater mistake could be made than to include the two branches in one central service.

In the first place a machine that is suitable for land service is not suitable for the sea. The conditions are widely different. Given a fairly level and smooth field, the army plane can take off and land upon it no matter in what part of the world the landing field be situated; but for sea service you must have a plane which can take off from or land upon the sea itself or upon the unstable platform of a ship which has been built especially for that purpose. Furthermore, not only must the naval aircraft be designed for these special conditions, but the flying man, to be thoroughly efficient, must have been bred to the sea. He must have acquired the sea instinct and initiative which is the mark of your efficient naval man and is every whit as essential to the officers and men who navigate in the air as to those who navigate upon the surface of the sea. The air squadrons of a great fleet must be trained to operate with that fleet and find their proper position in it just as completely as a battle-cruiser squadron, a cruiser squadron, or a flotilla of destroyers and submarines. They must know their commander-in-chief, be familiar with his tactics, and be on their toes all the time, ready almost to anticipate the orders which long familiarity and training have taught them to expect.

To put the flying activities of the navy under a separate outside organization such as the army or a United Air Service, would be as efficient as to have a United Bureau of Ordnance and have the navy constructor send the sketch plan of the proposed armament of the ships to such a body, with the request that they design the suitable guns, gun mounts, projectiles, ammunition hoists, and what not. Such a course would make for errors, misunderstandings and inefficiency.

Hitherto the development of naval aircraft has been everybody's task and the task of no one in particular. The immediate need of the navy is a responsible directing bureau in the navy which can care for naval aviation and foster its growth and development. Unless we have such a bureau, aviation will continue to stagger along and we shall be faced with a repetition of the failures which have been all too frequent in our submarine development.

The idea of coordination, as expressed in a United Air Service, is attractive as an abstract proposition. Great Britain thought so—tried it out—and has abandoned the idea as impracticable.—*The Scientific American*, Apr. 16, 1921.

SECRETARY DENBY OPPOSED TO UNIFIED AIR CONTROL.—Washington.—Secretary of the Navy Denby told the House Committee on Naval Affairs April 25 that he is absolutely opposed to a separate air service with unified control over army, navy, other governmental aviation and civilian flying.

The view of Mr. Denby was sought whiles he was urging the passage of legislation creating a Bureau of Aeronautics in the Navy Department, which President Harding recently recommended.

"A Bureau of Aeronautics in the Navy Department is necessary in the interest of aviation development," he said. "At present, aviation activities are scattered through perhaps a dozen bureaus. The plan is to bring all activities into one bureau."

The creation of such a bureau was recommended to President Harding by the National Advisory Committee for Aeronautics, which likewise urged the necessity for establishing a bureau of aeronautics in the Department of Commerce to take care of civil aviation, and went on record in opposition to separating aviation from the army or navy.

Secretary Denby urged the committee to be as liberal as possible in providing funds for the development of aviation in the navy.

"The people do not realize that our navy is lacking in one arm," he said. "Aviation has become a vital part of our naval forces. If our fleet should ever engage another force it should be just as fully equipped with planes and carriers as its opponent in order to be on an equal footing." He said a Bureau of Aeronautics would decrease expenses.—*The Aerial Age Weekly*, May 9, 1921.

AMERICAN AVIATION POLICY.—President Harding has submitted to Congress, with his approval, a report of the National Advisory Committee for Aeronautics, in which are recommended a naval air service, an army air service, and a bureau of aeronautics in the Department of Commerce to regulate air navigation and to encourage civil and commercial aviation. The President agrees with the army and navy officers who controlled the subcommittee making the report that a single air department for military, government and commercial purposes should not be created. On April 11 Chairman Kahn of the Military Affairs Committee introduced in the House of Representatives a bill providing for a single Bureau of Air "to make more effectual provision for the aerial defense of the United States and to provide for the concentration of national air strength." On the same day he introduced a bill "to regulate air navigation." The issue, then, of a single air department is before Congress.

In the report whose recommendations President Harding approves it is declared that "aviation is inseparable from the national defense," and that "it is of vital importance in time of peace to make the greatest possible progress in the science itself." And thereupon the committee proposes something that will impede "the greatest possible progress" in aviation; that is to say, it recommends a distribution of authority, initiative and responsibility among at least three agencies—the army, the navy and the Department of Commerce. "Neither the army nor the navy, nor both combined," says Brigadier General William Mitchell of the Army Air Service in his book, "Our Air Force, the Keystone of National Defense," "can be expected to develop, organize and perfect a flying corps and its employment to the greatest possible limit of which that weapon (the aeroplane) is capable." In his recent message to Congress President Harding said that "the civil development of aeronautics" must be encouraged to relieve the government "largely of the expense of development and of the maintenace of an industry now almost entirely borne by the government through appropriations for the military, naval and postal air services." The President might have added, what is of the first importance, that if progress in aeronautical invention is to be promoted, the government must have the co-operation and aid of the civilian or independent manufacturers. The prospect must be opened to them of selling their machines to companies engaged in freight and passenger traffic as well as to the government for the army, navy, and the Post Office and other departments.

How can the government encourage the civilian manufacturers aside from giving them contracts? By developing air routes and building aerodromes in all parts of the country, for use by commercial aviators as well as by the army, the navy and the post office. The committee headed by General C. T. Menoher and Admiral D. W. Taylor recognizes the necessity of this in its report when it recommends that the Army Air Service take up the work, with as much co-operation as it can get from other government agencies and from the states and municipalities. Indeed, the report to which President Harding gives his endorsement outlines a scheme of such magnitude that to submit it to several bodies for execution would be to court failure and to waste money. Concentration, and not distribution, is the key to success. Chairman Kahn's bills may need amendment, perhaps redrafting, but they point in the right direction. A nation that takes the lead in commercial aviation should have the best aerial offense and

defense. (*Editorial in New York Times.*)—*The Aerial Age Weekly*, May 2, 1921.

NEW FIGHT LOOMS OVER AIR POLICY.—The fight for an independent air service, waged for the past two years, has broken out afresh and with increased vigor since submittal of the report of the National Advisory Committee for Aeronautics on a Federal air program. In the controversy fanned by the report innuendoes are made that a report of a minority of the committee was withheld and President Harding deprived of part of the information he asked for.

All three civilian members of the National Advisory Committee, it is stated, signed the minority report. They are F. H. Russell, Glenn L. Martin and Sidney Waldon. Major W. G. Kilner is also stated to have signed the minority report.

This quartet in its minority report urged the President to direct the National Advisory Committee to consider and report on whether it is better to divide aeronautics among four departments, as is recommended in the majority report, or to establish a Department of the Air, a Unified Air Service or an Independent Air Force. They asked Dr. Charles D. Walcott, Chairman of the National Advisory Committee, to incorporate this suggestion with the majority report.

This was not done, and its omission is the ground for the charge that the President has been favored with only one side of the question. The majority report favors an Army Air Service, a Naval Air Service and an Air Mail Service conducted separately and independently as now, and a Bureau of Aeronautics in the Department of Commerce for regulation of air navigation. The National Advisory Committee on Aeronautics should be continued, the committee suggests, for scientific research in an advisory capacity for co-ordinating all federal aeronautical activities.

While the four constituting the minority of the committee are advocates of an independent air service, in which all air activities shall center, Dr. Walcott says they signed the majority report Mr. Waldon says that the minority report, after omission from the account of the committee's findings delivered to the President, was sent to Mr. Harding. The showdown of strength between the advocates of the different policies will come in Congress, to which the majority report has been transmitted by the White House.—*The Aerial Age Weekly*, May 2, 1921.

A PROPOSED AMERICAN TRANSPORT AEROPLANE.—The machine illustrated and briefly described is to carry forty passengers with all their baggage, and contains several interesting constructional features that are not as radical as they may seem at first sight. The use of metal construction, variable pitch propellers and supercharging, are admitted to be the next steps in development. The problem of supplying sufficient power to drive a large aeroplane has brought out several different solutions. Owing to the limited power available in one unit, the majority of the giant aeroplanes built have been powered by a multiplicity of engines; in several machines as many as six have been used successfully. The two general types of construction are, a central power group and a distribution between the wings. The solution proposed here is the employment of very large power units placed very close together, but driving the propellers directly.

This new transport machine is a biplane, and is planned to carry forty passengers, a crew of four and about 2400 pounds of freight. It is constructed of steel and aluminium, thus reducing fire risk. It is equipped with two 1200-horsepower dual V-engines, designed especially for the purpose, driving 12-foot, 4-bladed variable pitch propellers, which are patented by the designer.

The principal dimensions are as follows:

Span	125 ft.
Chord	16.5 ft.
Gap	14 ft.
Height overall	19 ft.
Length overall	75 ft.
Total area	3864 sq. ft.
Petrol tank capacity	1200 gal.
Endurance	12 hr. at 100 m. p. h.
Maximum speed	130 m. p. h.
Power loading	15.4 lb. per h. p.
Wing loading	9.6 lb. per sq. ft.
Total weight	18.5 tons.

—(*Flight*, Jan. 20, 1921.)—*The Technical Review*, Apr. 26, 1921.

ALCOGAS AVIATION FUEL.—An account of test made with a fuel mixture consisting of 40 per cent alcohol, 35 per cent petrol, 17 per cent benzol and 8 per cent other ingredients, in comparison with aviation petrol.

The fuel tests were made on a Liberty engine, in respect to the maximum power attainable, and the fuel consumption with the weakest mixture giving maximum power; the speed range was from 1400 to 1800 r. p. m., and the altitude range (as simulated in the altitude laboratory) was from 0 to 25,000 ft. Compression ratios of 5.6 and 7.2 were employed. A description of the fuels, and their physical properties is given, with the distillation temperatures; the initial boiling points were practically the same at 60 degrees C., whilst the 90 per cent values for the alcogas and petrol were 145 degrees C. and 127 degrees C respectively. A description of the test plant used and the manner of conducting the tests is included. The results of the tests which are described at some length and are illustrated by a large number of graphs may be summarized as follows:

(1) At 5.6 compression, the same maximum power production at ground level and a general average of 4 per cent more power at altitude was obtained for the alcogas; the maximum difference of power was 6 per cent at 6400 ft. and 1800 r. p. m. in favor of the alcogas.

(2) At 7.2 compression, an average, and fairly uniform increase of 4 per cent in power at altitude was obtained in favor of the alcogas, no comparative figure being obtained for the petrol at ground level.

(3) The alcogas showed a fuel consumption per b. h. p. from 10 to 15 per cent greater than the petrol for this maximum power at any altitude, speed or compression ratio. Owing to the 12 per cent higher density of alcogas the fuel consumption in terms of volume per b. h. p. was practically the same in the two cases.

(4) The thermal efficiency of the alcogas was superior by about 15 per cent. A pound of alcogas contains about 22 per cent less heat units than a pound of petrol, so that in securing more power with 15 per cent greater fuel weight it is evident that the available energy of alcogas is more fully realized than in the case of petrol.

(5) With the 7.2 compression ratio, the alcogas develops about 15 per cent greater power for the same fuel weight per unit power.

(6) The radiator capacity required per brake horse-power is the same in the two cases.

The alcogas was observed to give smoother running than when the same engine was run upon aviation petrol, but no information was obtained relating to the effect of the fuel on the continued operation of the engine. (V. R. Gage, S. W. Sparrow and D. R. Harper, Report No. 89 U. S. Advisory Committee for Aeronautics, 1920. 9 pp., 27 figs.)—*The Technical Review*, Apr. 12, 1921.

TRIAL FLIGHTS AND ACCEPTANCE TESTS FOR NEW TYPES OF AEROPLANES.—A. G. Fokker.—The ideal test pilot is, or should be, the designer of the machine. Unfortunately, this combination is very rare, and the designer has usually to rely on reports of others as to the properties of his machine. Until reliable recording instruments are in our possession, the "personal element" will predominate in the tests and "scientific" pilots are not always available.

The following are the main characteristics which an aeroplane should possess, and on which the test pilot should concentrate his attention:

Getting Off.—The machine should possess sufficient directional stability while running along the ground. As soon as the flying speed is reached it should be able to get off without the use of the elevator.

In Flight.—There should be no hunting, either in the horizontal or the vertical direction. The changing over from "power-flight altitude" to "gliding-flight altitude" should be automatic and quick. Even at the lowest flying speeds wing-flap controls should be possible. When executing curves there must be no tendency to go into a nose dive or spin. When side-slipping the machine should still be controllable. All rudder organs should be properly balanced.

Landing.—Smooth landing depends very much on the type of landing wheels and their position. By proper construction, any tendency to leave the ground again can be checked. (*Het Vliegveld*, Jan. 1, 1921.)—*Mechanical Engineering*, May, 1921.

ENGINEERING

TENDENCIES IN MARINE OIL ENGINE PRACTICE.—During the winter session now drawing to a close, there have been a number of notable technical papers read before the learned societies dealing with all branches of engineering, and where marine engineering is concerned perhaps the two most important have been "The Present Position of the Marine Diesel Oil Engine," by Mr. James Richardson, B. Sc., read before the Institution of Engineers and Shipbuilders in Scotland; and that on "Mechanical Gears of Double Reduction for Merchant Ships," by Mr. R. J. Walker, C. B. E. and Mr. S. S. Cook, B. A., before the Institution of Naval Architects. Selection of these papers is made for the reasons, firstly, that they deal with the two most modern developments in marine propulsive machinery, and, secondly, because we desire to draw attention to the trend of the discussions that ensued in both cases.

First, to deal with the oil engine question, as was perhaps inevitable, considerable attention was focussed on the relative merits of engines working on the four-stroke and the two-stroke cycles. Very definite statements were made in the paper on this subject, to the effect that most of the published data referring to power output obtained with two-cycle engines were incorrect, and these engines were credited with a power capacity that could not be sustained continuously at sea. This view was supported by reference to the submarine engine practice adopted in several important navies. Conditions in such service make imperative the reduction to a minimum of the space and weight of the main machinery, and it was noted in the paper that the four-cycle engine held a predominant position for satisfying these conditions.

On the theoretical side the author maintained that the limiting factor in respect of the power obtainable from any given size of combustion cylinder is the qauntity of heat that can be passed through unit thickness of cast iron per unit of time for a given maximum temperature at the inner surface of the metal. The limit on this basis is largely independent of the piston speed. For instance, with a high mean effective pressure a low speed of revolution may give a reasonable figure of heat transfer through the metal surrounding the combustion zone, and conversely, a low mean effective pressure will permit safely of a high speed of revolution. In

support of this contention, it may be noted that two-cycle engines, which have a higher mean effective pressure than is general with four-cycle, are mostly designed to run at a lower speed of revolution. Naturally in making comparisons on a mean pressure basis the mean effective pressure is that for the whole cycle. In the case of the four-cycle engine the cycle extends over two revolutions or four strokes, whilst with the two-cycle engine there is an explosion every revolution, or every two strokes.

The limiting rate of heat transfer is, of course, dependent on the material in use. Certainly for convenience of machine work and for general reliability, it is reasonable to assume, for the present at any rate, that an ordinary grade of good hard grey cast iron will be adopted and the limiting temperature of the inner face of the casting must not be such as to cause serious disintegration of the metal through the graphite plates and consequent liability to cracks, etc. Practice, at any rate with large four-cycle engines, has now reached such a stage that standardization has almost set in, and practice at sea has served definitely to give a safe figure for this question of heat transfer. Assuming that the proportion of the heat of the fuel that has to be abstracted from the burning gases is more or less constant, and that the stroke-bore ratio can be assumed as fixed, so that the area of the piston is practically an exact fraction of the total area of the combustion chamber, then the limiting condition can be expressed as pounds of fuel per hour consumed per square inch of piston area.

Taking the total amount of fuel per hour consumed in any cylinder and dividing it by the piston area in square inches the quotient should not greatly exceed 0.2 pounds per square inch per hour. This is certainly, a conservative rating, referring primarily to large engines and it could no doubt be safely exceeded for small cylinders. Large marine four-cycle practice over a number of years of continuous operation at sea, however, amply confirms the desirability of being conservative in this respect, indeed it was noted in Mr. Richardson's paper that even with the progress in design made within the last few years there has been generally a measurable increase in the weight and the space occupied by the slow-speed marine Diesel engine per horsepower developed continuously. This is due largely to the reduction in the rate of heat transfer.

The mean effective pressure for two-cycle engines on a brake horsepower basis appears from the table of mercantile engines given by Mr. Richardson to average about 66 pounds per square inch. The highest figure quoted is 73.5 pounds and the lowest 55, but the author held that it was very doubtful if a mean pressure higher than 55 pounds per square inch on a brake horsepower basis could be continuously sustained at sea. Three examples of two-cycle marine engines cited gave mean effective pressures of 73, 66 and 73 pounds per square inch on a brake horsepower basis, and the rate of heat transfer was equivalent to a fuel consumption of 0.39, 0.315, 0.345 pounds per hour per square inch of piston area.

Corresponding to these figures certain stresses are developed in the material. On certain assumptions, it was concluded that the stresses arising from unequal expansion may in the three cases quoted amount respectively to 24,000, 14,900, and 15,000 pounds per square inch, the highest stress occurring in the largest engine. It is quite obvious that fractures in cast iron cannot be a matter of surprise when such stresses are imposed. As already mentioned the safe rate of heat transfer corresponds to a fuel consumption of 0.2 pound per square inch of piston area per hour. Hence, if the two-cycle engines be reduced in power output to the same basis the mean effective pressure will fall to a very moderate one of less than 55 pounds, and there will be, Mr. Richardson maintains, little, if any, gain in space or reduction in weight, as compared with the four-cycle engine.

To examine a little further this all important question which is raised in this paper, and so fully pursued in the discussion, it cannot, owing to lack of published definite data, be said to be conclusively proved that the rate

of heat transfer equivalent to the combustion of 0.2 pounds per hour per square inch of piston area is altogether established as the limit apart from the question of the quality of the fuel and the maintenance of the exhaust valves, matters which are not exactly common to engines of both cycles.

With a low grade of fuel oil, exhaust valve maintenance may be so onerous as to demand a reduction in power output with the four-cycled engine, apart from the heat transfer question proper. On the other hand, two-cycle cylinders with exhaust ports on one side and scavenging air inlet ports opposite, where cool air enters to clear out the hot gases, are certainly highly stressed, during full power running at a high rating, in this particular part of the cylinder, as it must be borne in mind that the necessarily high velocity of the issuing exhaust gases involves a high rate of transfer of heat to the cooled exhaust bars, and adjacent parts.

No doubt the quality of the metal surrounding the hot gases will be gradually improved. Much research to this end is now in progress, and in due course the results so obtained will be translated into foundry practice. To such metallurgical improvements, engine design and performance will quickly respond. The special point we wish to urge is the fact that no data giving definite information regarding the two-cycle engine were given in the paper or discussion although there was ample testimony to the satisfactory performance of four-cycle engines. If there are two-cycle ships operating at sea with good results and working at high mean effective pressures and heat transfer figures, it would be greatly to the benefit of progress in marine engineering that the facts should we widely known.

Coming to the second paper it is probable that no marine engineering paper of recent times can have been so eagerly looked forward to as that of Messrs. Walker and Cook on "Mechanical Gears of Double Reduction for Merchant Ships," as there have been so many rumors of failures of mechanical double reduction gearing. Little enlightenment on a number of factors, however, was given by this paper, other than a certain amount of very interesting information on the one subject of torsional shaft vibration. It is, however, cheering to have the statement given by Engineer-Admiral Sir George Goodwin that failure was much less frequent than it had been 12 months ago, but whether a lessening of the tooth pressure or the exercise of greater care in workmanship, or both are responsible was not elicited. In this paper the authors quoted that in Great Britain and other countries (excluding America) the number of ships with double reduction gears built and under construction is about 220 representing a total of 1,150,000 horsepower. As successful examples only three designs—five ships—are quoted having constants in the equation for pinions over 10-inch diameter, viz., constant $= \frac{P}{\sqrt{d}}$ varying from 195 to 238. The statement that a constant between 180 and 220 is good practice, is made, although the authors hold that there is nothing to show that considerably higher loads than represented by the constants, could not be adopted. It is a well-known fact that a number of ships with double reduction gear are operating at sea at a fraction of pull power, and so with a very much smaller tooth pressure than that designed, as was well pointed out in the discussion by Captain Onyon, M. V. O., R. N. Are there any double reduction gears running at sea continuously with constants of 220 or higher? Again, the questions involved are of such importance as to demand a solution which can only be obtained by the recording and publishing of actual details of performance. If a high standard of workmanship, materials and lubricants are the critical factors, then it is necessary that standards of such accuracy should be formulated, and definite means for securing these be made general. We do not desire at present to deal in detail with this question. It is evident, however, from the two discourses which are the subject of this article that nothing but gain can accrue from a close co-operation between the engineer and the shipowner. What is desirable is a free expression of experience and a complete recording and

publication of full facts of performance. Along this path, and only by such means can these absorbing and highly important questions be raised from the present level of uncertainty and doubt to the realm of established experience.—*Engineering*, Apr. 8, 1921.

SIMPLEX DETECTOR SHOWS PRESENCE OF SALT IN BOILER FEED WATER.—The presence of salt in boilers is universally admitted to be highly objectional because of the reduced steaming capacity which results from salt being deposited on the heating surfaces, and also because of the danger of overheating which is always present when there is salt on these surfaces. In the case of water-tube boilers, which are now being used more extensively than in previous years, and where even a small deposit of salt may have serious consequences, greater precautions are generally taken to keep the feed fresh than when the ordinary type of boiler is installed.

In this connection mention may be made of a most remarkable instrument manufactured by the McNab Company of Bridgeport, which has been named the Simplex Salt Detector. It is so designed as to indicate at all times the grains of salt in each gallon of feed water, thus revealing the presence of salt before the water enters the boiler, even though the quantity be as little as one grain per gallon. Furthermore, should the quantity of salt suddenly increase as the result of a split condenser tube, or of the evaporator priming, the apparatus gives immediate warning of the fact by ringing a bell, and by causing the electric lamp contained within the instrument to burn with increased intensity. This permits of the defect being remedied before the density of the water in the boiler has increased perceptibly.

The presence of salt in the feed water of marine boilers is ordinarily due to leaking condenser tubes and to evaporators priming. In the usual course the water is tested by a salinometer, but this test is dependent upon the human element, as it is taken as and when the engineer sees fit or finds it convenient to do so. The salinometer does not detect the amount of salt entering the boiler through the feed line, but merely determines the quantity of salt in the boiler. The Simplex Salt Detector, however, detects and gives warning of the presence of salt in the feed water before it enters the boiler.

The working of this instrument is based on the well-known fact that pure water has a high electrical resistance, which, however, falls very quickly if certain compounds—of which ordinary salt is one—are added to the water. The essential part of the apparatus is a glass vessel fitted with two electrodes by which a current is passed through a sample of the feed water, the necessary current being taken from any convenient direct current power or lighting circuit. The electrodes are made of a special grade of platinum iridio and are so arranged that no metal part of the connections is in contact with the water. This is important as it avoids the excessive corrosion which would otherwise take place. The electrodes are adjustable so that the sensitiveness of the instrument can be varied.

As mentioned above, the instrument gives a continuous indication of the saltness of the feed, and this is done by having a small supply of feed water flowing through the glass vessel, entering at one end and flowing out at the opposite end. The resistance of water falls very rapidly for a small increase in the amount of salt present, and this tends to make the simplest arrangement too sensitive. To obviate this, in the Simplex system, a resistance is introduced which is in the form of an incandescent 105 volt carbon lamp contained within a brass dome on top of the instrument. The lamp shows no light when the water is fresh, but as soon as salt is present, will begin to glow a dull red, which gradually increases to full brightness as the salt increases. This enables the officer on watch to see at a glance whether there is salt in the feed, and if so, whether it is in sufficient quantity to require immediate attention.

A meter attached gives a quantitative indication of the amount of salt present in grains per gallon at 100 degrees Fahrenheit. A definite warning is given immediately the salt exceeds a fixed percentage, and is operated by a relay connected in series with the instrument. The relay is very easily adjusted.—*The Nautical Gazette*, Apr. 30, 1921.

ALUMINIUM AND ITS ALLOYS.—A report of three Cantor lectures delivered before the Royal Society of Arts, describing the properties of aluminium and its alloys and the lines of investigation leading to the production of alloys with varying properties particularly suited to diverse industrial uses. Aluminium is chiefly valued on account of its low specific gravity, but the strength of the pure metal is insufficient for many applications, and it is essential to alloy it with other metals to attain the necessary tenacity, this involving some sacrifice of the low specific gravity, except when magnesium is employed in combination, when the alloys are very easily corrodible. Another metal which may eventually prove to be a serious rival to aluminium is beryllium, otherwise known as glucinum, but this has not yet been developed commercially and its properties have not been fully investigated.

The industrial application of the alloys of aluminium is chiefly considered from the engineering aspect. At the present time their comparatively high cost restricts their use to cases where lightness is of considerable importance. The war gave a great incentive to their production and use for many purposes, but during peace, when conditions are much more competitive on a price basis, the extensive use of aluminium alloys in general engineering will be largely dependent on a reduction in the cost of aluminium. The compositions and specifications of various alloys developed for war purposes are given and the improvement in the quality of these alloys by ageing is noted. Prolonged annealing also effects the improvement, but is hardly considered to be of commercial application. In connection with the use of aluminium pistons in internal combustion engines, many investigations were made to determine which alloys exhibit the best tenacity at comparatively high temperatures, and a remarkable alloy is that containing 14 per cent of copper and 1 per cent of manganese which shows an increasing tenacity with increasing temperature up to 250° C. The alloy containing 4 per cent of copper, 2 per cent of nickel and 1½ per cent of magnesium, previously referred to, shows the highest tenacity of the whole series for all temperatures up to 310° C. The adoption of this alloy, will, it is considered, eliminate the occasional trouble experienced from burnt pistons. The use of aluminium alloy pistons has resulted in an increase of power of the order of 20 per cent being obtained from engines as compared with the use of iron or steel pistons. Piston slap and the growth of pistons is discussed, the latter effect being comparatively small and being capable of elimination by annealing. The question of securing the gudgeon pin in aluminium pistons and the possibility of the employment of the metal for bearing surfaces is considered in some detail. The use of aluminium for cylinder castings has not resulted in as many advantages as was anticipated, but in the case of air-cooled engines, the freedom from distortion owing to the high conductivity of aluminium is a marked advance. Aluminium cylinder heads can also be advantageously employed. The use of aluminium alloy connecting rods is a probable development. The construction of girder frameworks for rigid airships offered a wide field for aluminium alloys and it is considered that they will play an important part in the development of the all-metal aeroplane, the latest phases of this science being dealt with in detail. Considerable economy could be effected in railway work by the use of aluminium alloys in place of steel for the chassis of coaches, and in all applications where acceleration and retardation of masses is an important factor, while their use in bridge and roof construction would also effect great economies. (W. Rosenhain, D. Sc., F. R. S., *Journal of the Royal Society of Arts*, Nov. 5, 12, and 19, 1920.)—*The Technical Review*, Mar. 29, 1921.

ORDNANCE

NAVAL GUNNERY AND CONSTRUCTION.—The gunnery experiments which were carried out in the Channel early in February, and which resulted in the sinking of the ex-German battleship *Baden*, appear to have had a wider significance than was appreciated at the time. They were supposed to have been held mainly to determine the resistance of German armor and internal protection to the attack of heavy naval projectiles. No official account of the firing has been published, but we gather from unofficial reports that the bombardment was performed by the monitor *Lord Clive*, which had been temporarily armed with three heavy guns—of 15-inch or larger caliber—on a triple mounting, to which we shall revert later. The distance between firing ship and target was not great, but the guns were fired with reduced charges, which gave the projectiles a velocity equivalent to that which would remain to them at very long range. The fact that certain German ships of older design and less substantial protection had endured at the Battle of Jutland a tremendous amount of punishment without being sunk or absolutely disabled seemed to warrant the assumption that the *Baden* would survive a very severe hammering. This expectation was not fulfilled. So far as we are able to gather, her flotation, was destroyed long before the prescribed number of rounds had been fired, either because our projectiles were exceptionally destructive or because the armor and other defences of the ship were less robust than had been surmised. As originally planned, the tests, we believe, were to have included an attack by torpedo-carrying aircraft, though considering that the target was stationary, the practical value of the latter experiment cannot have been great. Even when allowance is made for the difficulty of obtaining a straight run from torpedoes which have been dropped into the sea from aircraft flying, perhaps, 50 feet above the surface at a speed of 70 to 90 miles an hour, it should not be hard to strike a motionless target with an overall length of nearly 590 feet. These torpedo attacks were duly delivered, but it is stated that the *Baden* had already been sunk by gunfire and was lying in shallow water, with a heavy list to starboard, when struck by the torpedoes. Our illustration shows the damaged ship lying partially submarged between Dean Tail and Dean Elbow buoys, between the mainland and the Isle of Wight. She has since been salved and patched up for further experiments.

In the absence of data as to the type of gun used in the attack, the number and character of the projectiles fired, their initial velocity, and the general conditions in which the firing took place, it would be futile to attempt any definite inferences from this most interesting gunnery experiment. Sir E. T. d'Eyncourt has stated, however, that the *Baden's* thickest armor failed under an attack which British-made plates of the same thickness would have resisted. It is certainly gratifying to have this authoritative tribute to the excellence of British armor. Sir Eustace d'Eyncourt's statement corroborates the remarks made by Sir Robert Hadfield at Sheffield last month, which we reproduced in our issue of April 1st. His claim was that at Jutland our armor withstood the attacks which it was designed to defeat, and kept out the German projectiles wherever its thickness warranted that expectation. He attributed the failure of the *Queen Mary's* 9-inch turret armor to the concentrated effect of two and probably three armor-piercing shell, a blow approximating to 48,000 foot-tons. On the other hand, as the photographs published in *The Engineer* of February 20, 1920, clearly showed, the 11-inch and 12-inch belt and barbette armor of the German battle-cruisers was holed repeatedly by our projectiles. In the course of the tests made with the *Baden* last February her waterline belt, nearly 14 inches thick was penetrated time after time, although, as we have said, the velocity of the projectiles had been reduced to correspond with firing at considerable range.

To illustrate the formidable nature of the target attacked we may quote from Mr. S. V. Goodall's description of the *Baden's* armor and protective plating, given in his recent paper read before the Institution of Naval Architects. The main belt, he stated, is 13¾ inches thick, tapering to 6½ inches at the lower edge; above this is a 9⅞-inch belt extending to the upper deck. This citadel is enclosed by athwartship armor bulkheads, and beyond them thinner side armor is fitted which terminates at armor bulkheads. Above the upper deck and set in about 5 feet from the deck edge is the 6½-inch armor of the secondary battery. The gap so formed is protected by 1⅜-inch deck plating. The deck above this battery is from 1⅜ inches to 1⅛ inches thick. The sloping protective deck—the middle deck amidships and aft—is 1⅜ inches thick; abaft the citadel this deck is increased in thickness up to a maximum of 4¾ inches over the steering gear. Forward of the citadel the protective deck—the lower deck—is generally 2⅜ inches thick. Barbette protection varies from 13¾-inch armor above the top decks to 1-inch plating at the bases of A and B turrets, and 4½-inch armor at the bases of X and Y turrets. Gunhouse armor is 13¾ inches thick at the front, 9⅞ inches at the sides, horizontal roof 3½ inches thick, and sloping roof 4¾-inch. The 5.9-inch casemates of the secondary battery are formed by transverse and longitudinal bulkheads of ⅞-inch plating. The fore conning tower has a maximum thickness of 13¾ inches with a 5⅞-inch roof, the corresponding thicknesses for the after conning tower being 7⅛ inches and 5¼ inches, respectively. Above the protective deck the coal bunkers extend practically from A to Y barbettes, and when filled with coal reinforce the protection afforded by belt and decks. A further addition to this protection is provided by the 1⅛-inch splinter bulkhead, which is a continuation to the upper deck of the torpedo protection bulkhead. Armor gratings protecting the openings in the forecastle and protective decks are of the built-up type formed by ½-inch bars. In some of the protective deck openings a second tier of gratings with bars fore and aft is fitted immediately below the upper tier. As regards protection against torpedoes, a longitudinal bulkhead 2 inches thick, terminating on 1⅜-inch transverse bulkheads, is fitted throughout the greater part of the length of the ship. Outside this are coal bunkers about 6 feet wide, and beyond these an air space 7 feet wide amidships and slightly less at the ends.

Whatever the shortcomings of our pre-Jutland armor-piercing projectiles may have been—and the defects attributed to them by Lord Jellicoe have been vigorously challenged by high authorities—there is not any doubt that the armor-piercing shells now used in the Royal Navy are of a most efficient type. The modifications introduced after Jutland concerned not merely the filling and the fuse, but a revision of the old proof requirements for armor-piercing shell bodies, which had become out of date. We have been assured by a leading artillery expert that the modified type of 13.5-inch armor-piercing shell now in use has great penetrating power at a given range than the 15-inch armor-piercing shell fired at Jutland, and is therefore the more destructive weapon of the two, notwithstanding that it weighs only 1400 pounds as against 1930 pounds. As the improvement extends to armor-piercing projectiles of all calibers, it goes without saying that the armament of our present-day battle fleet is incomparably more formidable than was the case a few years ago, though the ships remain the same. Before leaving this subject a word may be said about the German projectiles. It had been assumed that Germany had adopted very long shell for her heavy naval guns, but this opinion turns out to be incorrect, at least as regards the 15-inch gun. The pieces of this caliber in the *Baden* employed an armor-piercing shell 3.5 calibers long and a high-explosive shell 4.1 calibers long, the weight in both cases being 1653 pounds, of which the armor-piercing burster represented 51 9 pounds and the high-explosive burster 148 pounds. The German 15-inch projectile was thus nearly 300

pounds lighter than the British, and its length did not exceed that of the latter. On the other hand, the German 11-inch and 12-inch high-explosive shell had a length of approximately 4½ calibers. The principle of using very long projectiles is not by any means of recent date, for as far back as 1871 we find Sir Joseph Whitworth writing as follows: "I desire to make all guns capable of firing powerful shells six diameters long, using the regular charge of powder. When high velocity is required, and for long ranges, then projectiles should be from three to four diameters long." It does not appear that shell of six diameters in length have ever been fired in actual warfare though the 12-inch high-explosive "portmanteaux," loaded with "Shimose," with which the Japanese attacked the Russian ships Tsushima, are said to have been over 5 feet long. They tumbled badly in flight, but despite this a remarkably high percentage of hits was made, and the heavy burster caused great havoc.

Gunnery practice against ship targets has not hitherto been indulged in by the British Navy to the same extent as in foreign navies, nor when such tests were made have they invariably been rendered as instructive as they might have been. On such occasions it has been customary to select some obsolete ship and subject it to bombardment by modern ordnance without attempting to reproduce in the target the defensive qualities that would be encountered in modern armored ships. Generally, therefore, the result has been to convey an exaggerated impression of the destructive powers of the projectiles employed. This undoubtedly occurred in the cases of the *Belleisle, Edinburgh,* and *Hero* experiments. In Germany, France, and the United States a more practical value was often given to such tests by reconstructing the target to resemble in part a modern ship. Germany led the way in this direction, spending large sums yearly on the fitting out of target ships, whole squadrons of which were sometimes attacked simultaneously. The most fruitful American was that to which the *San Marcos*—ex *Texas*—was subjected in March, 1911, for the result brought about a revolution in American ideas of armor protection and led to the abandonment of armor on the topsides and its concentration on the water line, gun positions, and other vital parts. When all is said and done, however, peace experiments can never be as instructive as actual war experience. It is probable that our naval officers and constructors derived more useful information from Jutland and the Dogger Bank than they could have obtained from years of ceaseless peace experiment on a lavish scale. Whatever the object of attacking the *Baden* may have been, it was certainly not to stage a mere pyrotechnical display. The Admiralty may have desired to test the present type of armor-piercing shell against the thickest armor of a modern ship, to determine some unsolved question of protection, or, perhaps, to try a new piece of naval ordnance in contemplation for the battleships of the current program.

The fact that a triple mounting for heavy guns was used in the experiment is very suggestive, and while there is no definite evidence that this system of mounting is to be adopted in the new battleships, the indications certainly point that way. In common with many other innovations in naval design, we owe this system to the Italians, who first introduced it in the *Dante Alighieri,* laid down in 1909. By taking the bold step of disposing the main armament in triple turrets, the late Colonel Cuniberti was able to mount a battery of twelve 12-inch guns, associated with a powerful quick-firing armament, in a ship of only 19,500 tons, well protected over the vitals, with an adequate coal capacity, and possessing the remarkable speed of 23 knots. Had the conventional twin mounting been retained, it would not, he estimated, have been possible to arm the ship with more than ten 12-inch guns, and even then less weight and space would have been left over for protection, machinery, etc. So substantial a gain went far to offset the objections—real or imaginary—which had previously militated against the grouping of more than two heavy guns in one position. In the same year the triple turret was adopted by Russia for the four

battleships of the *Gangut* class, in the designing of which Colonel Cuniberti had a large share; and in 1910 Austria followed suit by laying down the *Viribus Unitis*, whose twelve 12-inch guns were on triple mountings. Reports of the gunnery trials of the *Dante Alighieri* and *Viribus Unitis* were conflicting, some accounts stating that the complicated mechanism had proved fatal to rapid fire and that the deflection caused by the discharge of the side guns made accurate practice impossible. On the other hand, the Italian authorities professed themselves perfectly satisfied with the triple turret, which, they declared, was as simple to manipulate and as accurate in fire as the twin mounting. Meanwhile experiments were in progress across the Atlantic, and in 1912 it was announced that the two battleships to be laid down that year, the *Oklahoma* and *Nevada*, would have part of the main armament disposed in three-gun turrets. That these must have proved satisfactory is evident from the circumstance that all the American battleships built subsequently, excepting only the four *Marylands*, have their main armament mounted on the same principle. Both the deflection trouble and the tendency, when the three guns are fired simultaneously, of mutual "air wave" interference to prejudice the accurate flight of the projectiles, are said to have been overcome by discharging the right and left-hand guns together and the middle gun a fraction of a second later, the necessary interval being secured by a special device. In the earlier American mountings of this pattern the three guns are apparently mounted on a common slide and could not be elevated or depressed independently of one another; the installation, therefore, was to all intents a three-barrelled gun. But in later ships this principle appears to have been discarded, for a photograph of the battleship *Tennessee*, published in *The Engineer* of May 21, 1920, distinctly showed the three 14-inch guns in each of the forward turrets at varying angles of elevation.

Turning to the question of weight, it would appear that while the Italians employed most of the weight saved by concentrating 12 guns on 4 mountings instead of 6 in increasing the power of the machinery, the Americans have preferred to utilize the margin in reinforcing the armor on the gun positions, with the result that the gross weight of two triple turrets is little, if at all, below that of three twin turrets less stoutly armored. We draw this conclusion from official American figures, according to which the weight of a 14-inch turret, containing three 14-inch 50-caliber guns, is "not far from 2500 tons, of which total, of course, the armor is the greater part." Since the weight of a British pattern turret, containing two 15-inch 45-caliber guns, with their ammunition and accessories, is understood not to exceed 1350 tons, it would seem that the weight of six American 14-inch 50-caliber guns, triple mounted, is greatly in excess of that of six British 15-inch 45-caliber guns mounted in pairs, the figures being 5000 and 4050 tons, respectively. The disparity is so great that we assume that some item or items of weight not included in the British total are contained in the American figure. Hitherto the triple mounting has been looked at askance by British naval opinion, but it may well be that the necessity of endowing our new ships with increased gun power without unduly magnifying dimensions has forced the Admiralty to accept a system which it does not view with entire favor. In that case its attitude is on a par with that of Rear Admiral Twining, U. S. N., Chief of the Bureau of Ordnance, who in 1912 expressed a dislike for the triple turret, but nevertheless recommended it as the only method by which the weight needed for additional protection could be saved. Although the triple turret has yet been fitted in a British ship, 12-inch mountings of this description are believed to have been manufactured by Armstrong, Whitworth and Co. for the Italian Government, and a description of one such mounting, designed at Elswick, was published in 1913. In this case the guns were independently elevated and depressed by hydraulic power, controlled by valves in the sighting position.

Provided that accuracy of fire and facility of working the guns are not unduly prejudiced thereby, the adoption of triple turrets for our new ships, if resolved upon, must be considered a wise step. Having decided to resume capital ship construction after a pause of five years, we find that other powers are completing and building ships which in armament and speed will far surpass the finest vessels we now possess. Our designers must therefore cast about for some expedient which will enable them to produce a new type, approximately equal in battle power to the best ships in other navies, without putting an intolerable strain on the national purse. It would be easy enough to recover our place at a bound by laying down ships of unheard-of dimensions and cost, but there are weighty reasons against such a policy. The solution must consequently be sought, not in mere size, but in technical modifications, such as a greater concentration of armament, new methods of protection, and weight-saving principles in the machinery department. If our designers and marine engineers are put upon their mettle they will, we feel confident, evolve a type of warship which need fear no comparison with foreign contemporaries of equal or greater displacement and cost The most powerful battleship now under construction is the United States *Indiana* type, which displaces 43,200 tons and is armed with twelve 16-inch 50-caliber guns, the speed being 23 knots. It does not follow that the Admiralty will deem it prudent to put so many eggs into one basket, nor is it certain that 23-knot battleships would be the most suitable investment for the British Navy. By contenting ourselves with a battery of ten 15-inch or 16-inch guns, in four turrets, with adequate but not exaggerated protection against gunfire and submerged attack, machinery and boilers designed to generate the maximum power for their weight, and—last but not least—by thoroughly reviewing the existing standards of stress to determine the feasibility of accepting lighter scantlings, we may arrive at a type of ship which, if inferior in displacement and cost to the heaviest vessels building elsewhere, will yet be admirably suited to the requirements of the naval defence of the Empire.—*The Engineer*, Apr. 22, 1921.

BRITISH SHELL AND ARMOR AT THE BATTLE OF JUTLAND.—*Excerpt from Speech by Sir Robert Hadfield, Bt.*—It is very regrettable if the impression should have become prevalent, not only in England, but abroad also, that the British ships were inferior to those of the German Fleet.

After a careful study of the dispatches and other sources of information, one is now forced to the conclusion that the British vessels are second to none either in construction or material, as shown in the recent and very able paper, "Notes on some features of German Warship construction," by Sir Eustace T. d'Eyncourt, K. C. B., F. R. S., read before the recent session of the Institute of Naval Architects, and also a paper by Mr. S. V. Goodall, M. B. E., read at the same session, on "The Ex-German Battleship *Baden*."

So far as we here are concerned, the principal interest is centered in the matériel side, and Sheffield has every right to be proud of the great part it has taken in producing machinery, guns, armor, and projectiles required for the fleet, which have proved to be entirely adequate for their respective duties within the scope of their design.

The calamity, almost incredible in its swiftness and completeness, which overtook three of our armored cruisers appears to have led to a belief in the super-excellence of the German armor piercing shell, and the public has attributed the sinking of these three ships to the inferiority of their armor.

In considering the protection provided for our vessels, it is difficult to avoid entering the field of design, and, if this side is omitted, it is not possible to form a just appreciation of the value of the armor plates fitted in the British ships.

The distribution of the armor has a very marked influence upon its value, and for a given weight above the minimum necessary its increased value as "protection" is out of all proportion to the increase of the weight.

The German battleships of the *Kaiser* class built in 1911 were armored to the extent of 35 per cent of the total displacement, while similar British ships, the *Orion* class, had but 29 per cent. The *Seydlitz*, built in 1912, carried 31 per cent, against the ships of the *Lion* and *Queen Mary* class of the same date, 23 per cent.

Thus, while there is an important difference between the percentage weights of armor worn by the opposing vessels, these figures give but an inadequate idea of its actual protectional value.

It is common knowledge that the German Fleet was never intended to seek its enemy in foreign waters, while our fleet sacrificed armor in order to carry fuel sufficient to fight an action wherever the enemy might be found, and in addition to this our designers were under the added and important restrictions imposed by the lack of capacity in the available dock accommodation.

It is, however, a fact that British armor withstood the attacks which it was designed to defeat, and kept out the German projectiles wherever its thickness warranted this expectation.

The 9-inch armor on the *Queen Mary's* turret failed under the concentrated effect of two, and probably three, armor-piercing shell fired by the *Derfflinger*, a blow approximating to 48,000 foot tons; the *Indefatigable* succumbing to two blows approximating to 32,400 foot tons from the 11-inch guns of the *Von-der-Tann*, delivered in quick succession, one taking effect in the vicinity of the after-turret, the second striking the 7-inch armor immediately under the fore-turret.

Later in the day a 7-inch turret in the *Invincible* was struck by a salvo of three or four shells from the 12-inch guns of the *Derfflinger*.

The *Queen Mary* was only in action 32 minutes; the *Indefatigable* 15 minutes, and the *Invincible* 12 minutes. In each case the ship sank due to the explosion of the magazine below.

The 11-inch and 12-inch belt armor of the German battle cruisers was perforated repeatedly, and it was due to their armored decks and to their very adequate sub-division into watertight compartments more than to their heavy belt armor that four of them managed to struggle back to port, there to remain under repair for some five or six months.

My firm are particularly interested in the matter of the performance of the armor-piercing shell of the fleet, and now that the imposition of silence has passed I feel one may be permitted to speak upon a matter which so nearly concerns ourselves.

The impression created by the statements in Lord Jellicoe's book was as fortunate as it was unintentional. A close examination of the actual phrases used discloses the fact that there was no imputation against the metallurgical properties and treatment of the shell body as an armor piercer, and, indeed, where the shell functioned properly as a whole, the turret, side, and deck armor of the German ships was repeatedly perforated; and this not with salvos, but by shell falling singly.

Photographs published in the *Engineer*, February 20, 1920, show the excellent effects obtained.

That Lord Jellicoe, on his appointment as First Sea Lord, assembled a committee to consider the whole subject of the performance of the British projectiles is a matter for congratulation.

As a result of their deliberations, it became immediately evident that not only the explosive, the method of filling, and fuse then in use, demanded improvement, but also that the old proof requirements for the armor-piercing shell bodies were out of date.

The Admiralty therefore presented to the armor-piercing shell manufacturers the problem of the attack of armor at an angle to its face, and

Lord Jellicoe, in his later book, "The Crisis of the Naval War," records his appreciation of the work done in the following words:

"The greatest credit was due to the Ordnance Department and to our enterprising manufacturers for the feat which they achieved."

Fortunately, my firm, amongst others no doubt, had already travelled some distance along that path, but the conditions asked for were far more severe than any that had been hitherto seriously considered by the authorities and technical experts of any of the great naval powers.

It is impossible to convey in a few words the many technical difficulties met with in solving the problem, but it is sufficient to say that they involve a complete revolution in armor-piercing projectile manufacture, not only metallurgically, but in design also; and the whole problem had to be worked out with the least possible delay, and under war conditions of labor.

Although in the case of my own firm we had previously accomplished a great deal, as official records, if consulted, would show, the final solution of the problem occupied several months of research and experiments, but by then success at proof tests was more or less established, and, as stated by Lord Jellicoe, within twelve months the fleet was equipped with armor-piercing shell of this new type.

Since that time further improvements have been introduced, and the work of investigation and research still progresses. We may here remark that some wonderful results have been obtained.

It must not be supposed that the total expenditure of ammunition at Jutland consisted exclusively or armor-piercing projectiles. The choice lies largely in the hands of the Captain and gunnery officer of the ship, and is governed by the description of the target, the range, and the visibility.

The British fired rather less than 50 per cent of armor piercers, and when the diversity of the targets (enemy ships) is remembered, this is not surprising. It would be as wrong to fire armor-piercing shell at a destroyer or light cruiser as it would be to fire high-explosive shell at an armored battleship, and the lack of visibility no doubt militated against a larger proportion of armor piercers being used.

Commander Von Hase remarks that while he in the *Derfflinger* used only armor-piercing projectiles, the gunnery officer of the *Lutzow* used high-explosive exclusively against the *Lion*, and this explains the outbreak of fires which occurred in that ship during the early part of the action.

There is no official record of the number of hits obtained by heavy shell, but from other sources we may by selection arrive at a useful comparison of the relative efficiency of the British and German projectiles.

The *Princess Royal* was hit nine times, probably all 12-inch armor-piercing shell, and remained in action with one turret disabled.

The *Derfflinger*, hit by seven heavy shell of 13.5-inch or 15-inch caliber, probably all armor-piercing projectiles, remained in the line, but with her two after-turrets wrecked, a third partially disabled, and only one turret left in effective condition.

The *Warspite* received 27 hits by heavy German shell, and after the action steamed across the North Sea at full speed.

The *König*, having only 15 hits, arrived with difficulty at Hamburg with four of her forward compartments flooded, and her forcastle only six feet above water. The ship was so damaged as to be *hors de combat*.

It would be unfair to attribute the sinking of the three British battle cruisers to the armor-piercing qualities alone of the German projectiles. It should, too, be borne in mind that the armor on these particular ships was comparatively thin. That the turret armor of these three ships was perforated there is no doubt, but this result seems to have been attained by the weight of the combined blow of several shell striking more or less together, and not to the armor-piercing effect of single shell.

The immediate cause of their loss was the explosion of their magazines, and this might equally well have been the fate of the *Lion*, whose turret armor was perforated, and also the *Derfflinger*, whose two after-turrets were wrecked by British armor-piercing shell.

None of the British armored ships were sunk as the direct effect of gun attack, while two German ships, the *Lutzow* and *Seydlitz*, actually suffered this fate. The former ship was finished off with a German torpedo to hasten her end, while the latter was run ashore to prevent her sinking in deep water.

We thus arrive at the conclusion that any impression of German superiority in material is unwarranted.

Having had the exceptional opportunity of examining in a most exhaustive manner modern German (Krupp) armor-piercing shell, and also been in possession of comparative results of plate tests of contemporary German and British armor piercers, it can be confidently asserted that at the time of the Battle of Jutland the British ships were armed with a better projectile.

Shell of the improved type, now forming the armament of our ships, are not only far more efficient than the older type, but are well in advance of anything yet produced by other countries.

From the statements of our First Sea Lord, and also the Report of the United States Board of Admiralty (1920), it is clear that we must in no way relax our efforts of research and development in this direction. Both emphasize the fact that the battleship is still the main power of the fleet. The words of the United States Admiralty Report sums up the matter thus:

"Nothing that occurred during the World War has served to change the opinion of the General Board as to the vital importance in war of the battleship, the ship that can at once give and take heavy blows."

During history our fleet has progressed along strictly evolutionary lines, and it is only by following this precedent that we can maintain our supremacy.

With the lessons of Jutland before them, the Admiralty have stated their intention of continuing the development of the capital ship, and no one who has made a study of the true facts can question the correctness of their decision.

There is no reason why this policy should deprive the submarine and aircraft school of their right and proper opportunities for development.

The era of armor and armor-piercing shell has by no means passed, and there is no sign of relaxation in the world's effort towards the improvement of these essential factors.

THE OPERATION OF HEAVY ARMORED TURRETS.—After discussing the advantages of the several methods in use for manipulating armored turrets and their internal mechanism, whether hydraulically, electrically, or by compressed air, the author comes to the conclusion that the power supplied should be electric, and should be led in by movable pivoting leads. Training is best performed by electricity, while the elevating, loading and breech mechanism is best operated hydraulically, and he gives considerations which should govern the choice of the type of drive most suitable to the other operations.

The hydraulic power required in the turret should be generated in the moving turret itself, by using electric pumps, having standard parts which can be replaced and repaired on board the ship.

Whether any alterations will be required in the elevating gear in turrets adapted to director-work remains to be seen; for at present the use of hydraulic power developed in the turret by electric means has not been put to test. (Oberregierunzsbaurat Methling, *Schiffbau*, Oct. 20, 1920.)—*The Technical Review*, Mar. 29, 1921.

RADIO

GUNNERY AND TORPEDO-PLANING.—*Sir:* As an American of English descent, a former member of the Naval Consulting Board, and a man interested from boyhood in navies and in everything pertaining to the sea, I have always been an intense admirer of the British Navy. I have been especially an admirer of the work of the late Lord Fisher—whom we regard as one of the great figures of naval history—in mechanizing British sea power, and of the strides made by the British Navy, under the leadership of Admiral Sir Percy Scott, R. N., in speed and accuracy of gun fire, since the latter's first memorable performance in H. M. S. *Scylla* in 1899, both in using individual naval telescope sights on gun mounts and with the director system.

As one of the pioneers of the aeronautical movement, and a governor of the Aero Club of America for many years, I have been profoundly impressed by the British Navy's skilful development of the torpedo-plane since 1913; and I believe that great good will result from the controversy now going forward in your country and ours over the effect the torpedo will have on the capital ship.

But, while having the utmost respect for the superb performance of the British Navy, I cannot square with the spirit of fair play, for which the British officer is beloved the world over, the fact that British naval officers, in discussing their achievements in gunnery and torpedo-planing, have continually refrained from mentioning the truth that they owe the naval telescope sight, the director system, and the torpedo-plane to an American naval officer, the present Rear-Admiral Bradley A. Fiske.

Admiral Fiske—then Lieutenant Fiske—took out the basic patents for the naval telescope sight and the director system in 1890. Both were described on page 506 of London *Engineering* on April 24, 1891, and in *La Revue d'Artillerie* on March 12, 1892, as well as in such newspapers as the *New York Times*, and many naval and scientific periodicals on many occasions. Furthermore, the fact was later published broadcast, that on September 22, 1892, on board the U. S. S. *Yorktown*, in Behring Sea, Lieutenant Fiske, using his telescope sight, made a record at target practice with a six-inch gun that was wholly unprecedented. This subject was elucidated at great length by Lieutenant Fiske in an article that was published in the U. S. NAVAL INSTITUTE PROCEEDINGS in June, 1896.

Moreover, it was perfectly well known by all the navies that the U. S. Navy adopted the telescope sight shortly after Lieutenant Fiske's demonstration in 1892, and that it was used in the U. S. S. *Olympia* at the battle of Manila Bay on May 1, 1898, and in all the American battleships at the battle of Santiago on July 3, 1898. Still, the British Navy date the improvement of modern naval gunnery from the performance of H. M. S. *Scylla*, in 1899, and attribute the invention of the naval telescope sight and the director system to Sir Percy Scott.

I cannot but find the British Navy similarly remiss in regard to the torpedo-plane, for the torpedo-plane was patented by Admiral Fiske on July 16, 1912; and the fact was widely published, and with full illustrations and description, during the remaining months of 1912 and the early part of 1913. The British and Italians began experiments with it in 1913. In 1915 certain Turkish craft—I think four—were sunk by a British torpedo-plane in the Sea of Marmora, and in 1917, I believe, the Germans sank two British steamers in the North Sea. Since then all the great navies have been at work developing it; but so far as I have been able to ascertain, they have not only followed the general plan described in Fiske's original patent, but have adhered almost exactly to the mechanical apparatus described in his patent, even to its details. Nevertheless, Mr. Bywater, in your issue of February 16, 1921, refers to Fiske merely as the first to advocate air torpedo work in the United States.

All of the facts that I narrate can easily be verified by reference to the United States Patent-Office, and to leading newspapers and other periodicals printed in the English, French, German, Spanish, Russian, and Japanese languages, and to Fiske's autobiography, which has been on sale in England for more than a year.

Surely it cannot be the intention of the British Navy to claim credit it does not deserve, not to withhold from a distinguished officer in a sister navy the credit to which he is entitled for useful achievement.

In closing, please permit me to express my appreciation of the fairness and good feeling which you invariably display in treating American subjects. Your attitude has won you the confidence and respect of your American readers.—Respectfully,

HENRY A. WISE WOOD.

—*The Naval and Military Record,* Mar. 30, 1921.

WHO INVENTED TORPEDO-PLANES?—We published in our issue of March 30 a letter from Mr. Henry A. Wise Wood, of New York, who entered a courteous protest against the presumption, general on this side, that the naval telescope sight, the director system, and the torpedo-plane were British inventions, when the fact is, he declared, that we owe all these things to an American naval officer, the present Rear-Admiral Bradley A. Fiske. We forwarded Mr. Wood's letter to Admiral Sir Percy Scott, and invited him to comment upon it, but, being at present away from his books of reference, he has been unable to favor us with a detailed reply. However, he informs us that when he was commander of the *Edinburgh* in (he thinks) 1897, telescope sights had been in use on turrets for some time, but "possibly Admiral Fiske was the inventor." We believe that Admiral Fiske was, in fact, first in the field with this device, which made accurate shooting possible at longe range and certainly the evidence which Mr. Wood adduces on this head seems overwhelming.

We have also read that Admiral Fiske evolved an effective system of director firing many years ago, but we do not know whether this system was fundamentally the same as that which Sir Percy Scott perfected, or whether its introduction into the United States Navy ante-dated the adoption of the Scott director by the British Navy As regards torpedo-planing, we are aware that Admiral Fiske has been for some years a strong advocate of this weapon, and we accept Mr. Wood's statement that the Admiral was the pioneer of air torpedo tactics. So far as we are concerned, the last thing we desire is "to withhold from a distinguished officer in a sister navy the credit to which he is entitled for useful achievement." Admiral Fiske, we would add, is widely known and esteemed in British naval circles both as a sea officer of the very best type and as a man of brilliant inventive genius. We remember him, also, as having publicly defended the policy of the British Admiralty towards the *U*-boat menace at a time when that policy was being subjected to criticism by other American officers who were not conversant with the peculiar conditions of warfare in the North Sea.—*The Naval and Military Record,* Apr. 20, 1921.

CURRENT NAVAL AND PROFESSIONAL PAPERS

Influence of the Depth of Water on Speed of Ships. II. *The Engineer,* Apr. 1, 1921.

The Passenger Carrying Airship *R-36. Engineering,* Apr. 15, 1921.

Radio Communication with Postal Aeroplanes. *The Aerial Age Weekly,* Apr. 18, 1921.

British Sloops during the World War. *Marine Engineer and Naval Architect,* April, 1921.

Liquid Oxygen Explosives. *The Engineer,* Apr. 22, 1921.

Wireless Telephony. *Journal of the Royal Artillery,* April, 1921.

NOTES ON INTERNATIONAL AFFAIRS

FROM APRIL 10 TO MAY 10

PREPARED BY

PROFESSOR ALLAN WESTCOTT, U. S. Naval Academy

GERMAN REPARATIONS SETTLEMENT

UNITED STATES MEDIATION.—According to the Treaty of Versailles, May 1, 1921, was the date fixed for final settlement of the amount of German reparations. On April 20 Germany sent an appeal to the United States Government, requesting the President to mediate the reparations question, and pledging itself to fulfil "all the provisions of any award that may be made."

This request Secretary Hughes declined in a brief note as follows:

WASHINGTON, April 21, 1921. This government could not agree to mediate the question of reparation with a view to acting as umpire in its settlement.

Impressed, however, with the seriousness of the issues involved, as they affect the whole world, the government of the United States feels itself to be deeply concerned with the question of obtaining an early and just solution. This government strongly desires that there should be an immediate resumption of negotiations and reiterates its earnest hope that the German Government will promptly formulate such proposals as would present a proper basis of discussion.

Should the German Government take this course, this government will consider bringing the matter to the attention of the allied governments in a manner acceptable to them in order that negotiations may speedily be resumed.

GERMANY HOLDS GOLD RESERVE.—On April 18 the Reparations Commission demanded that, as security for payments to the Allies, the entire gold reserve of the German Reichsbank, amounting to 1,100,000,000 gold marks, should be transferred to the branch banks at Cologne or Coblenz in territory under Allied control. This Germany refused, and the refusal was regarded as a further violation of the treaty requirements.

GERMAN REPARATIONS PROPOSAL.—Following the refusal of the United States to act as mediator, the German Government submitted through the agency of the United States a final proposal, which was declared to be "the maximum of what can be offered." The proposal was to pay reparations to the amount of 50 billion gold marks (present value) in the form of annuities which would bring the ultimate total of money paid to about 200 billion gold marks. Various details and somewhat vague conditions were attached, including 1 billion marks as initial payment, 4 per cent interest, and an offer to take over the Allied debts to the United States.

ALLIES REJECT GERMAN OFFER.—The French Government at once signified to the American Government its rejection of the German proposal, stating that the German offer was but 50 per cent of the total agreed upon by the Allies at Paris (226 billion gold marks plus 12 per cent of the value of exports) and but 35 per cent of the Reparations Commission's more recent estimate of about 140 billion marks (present value). Premier Lloyd George in Parliament on April 28 declared the offer "thoroughly unsatisfactory." Secretary Hughes on May 2 transmitted the Allied views to Germany in a brief note which advised Germany to make at once "clear, definite, and adequate proposals, which would in all respects meet its just obligations."

ULTIMATUM TO GERMANY.—The Supreme Council, in session in London, on May 5 presented to Germany an ultimatum requiring that Germany admit liability for the full 132 billion marks (present value) fixed by the Reparations Commission, and that this admission be made before May 13, on penalty of Allied occupation of the Ruhr Valley. France called the class of 1919 to the colors and mobilized war forces in readiness to enforce the penalty.

DETAIL OF ALLIED DEMANDS.—Paris, May 6.—The Reparations Commission made public to-day the Allied plan for payment by Germany of the reparation account. A study of this plan shows that the basis of it is a system of bonds of the face value of 132,000,000,000 gold marks, the total of the indemnity fixed by the Reparations Commission. Germany would pledge herself to pay a sum which would provide for the payment of 5 per cent interest on these bonds and a sinking fund.

This is the plan Germany must accept by noon on May 12 to avoid occupation of the Ruhr. The system is of direct interest to America, for it is an essential part of the plan that the Allies realize in the near future a certain amount of cash, of which America has a great deal and other nations very little.

The system does not call for direct payments by Germany to the Allies. Germany gives bonds to the Reparations Commission, the Reparations Commission hands over the bonds to the different Allied nations and pays to the holder of the bonds interest from a fund Germany supplies.

Therefore France will not receive 68,500,000,000 marks, 52 per cent of the total, in cash, but will receive 68,500,000,000 marks in German bonds. She would not receive these all at once. Twelve billion marks worth of bonds are to be issued at once and 38,000,000,000 more in the future. Therefore a year from now France will be the holder of something less than 30,000,000,000 marks, face value, of the bonds.

France Must Market Bonds.—Now, if France put these bonds in her vaults and held them she would receive interest at the rate of 1,500,000,000 gold marks annually. But that would by no means solve the bad financial situation of the French Government. That would mean an annual reparation income of some 5,000,000,000 paper francs, present value, whereas France has already paid out 55,000,000,000 paper francs for reparation and needs 16,000,000,000 more for this year. Therefore it is obvious France must sell the bonds she would receive.

This raises a question very serious for France of the market value of a German bond paying 5 per cent. It would not sell at par. If all doubt of its value were removed, a study of the market indicates a value something like 75 per cent of par and, due to the uncertainty of Germany's making good, its value would propably be less. Therefore it seems a safe assumption that France's share of the reparation payments is going to be much

less than the face value, 68,500,000,000 marks. To estimate the effect this fact will have on French opinion one should bear in mind that the French public started by expecting 200,000,000,000 gold marks.—*N. Y. Times*, 7/5.

GERMAN ACCEPTANCE.—In the face of the reparations crisis the Fehrenbach cabinet resigned on May 4, but pending the formation of a new cabinet was requested by President Ebert to continue to deal with current affairs. In view of the apparent eagerness of France to enter the Ruhr region, and on the other hand with the prospect of securing the major part of Upper Silesia and creating a favorable impression in England and May 5 swung towards acceptance of the Allied terms. On May 11 the new Wirth Cabinet accepted the terms unconditionally.

UNITED STATES RE-ENTERS ALLIED COUNCILS

TEXT OF INVITATION AND REPLY.—At a meeting of the Supreme Council in London it was decided on May 4 that the United States be invited to send representatives again to the Supreme Council, the Council of Ambassadors, and the Reparations Commission. To this the American Government replied favorably. Ambassador Wallace resumed his seat in the Council of Ambassadors on May 9.

Allied Invitation.—As President of the Allied Conference, which is just completing its sittings in London, I am authorized with the unanimous concurrence of all the powers here represented to express to the United States Government our feeling that the settlement of the international difficulties in which the world is still involved would be materially assisted by the co-operation of the United States; and I am, therefore, to inquire whether that government is disposed to be represented in the future, as it was at an earlier date, at Allied conferences, wherever they may meet, at the Ambassadors' Conference, which sits at Paris, and on the Reparations Commission.

We are united in feeling that American cognizance of our proceedings and, where possible, American participation in them, will be best facilitated by this.

American Reply (May 6).—The government of the United States, while maintaining the traditional policy of abstention from participation in matters of distinctly European concern, is deeply interested in the proper encouragement and in the just settlement of matters of worldwide importance which are under discussion in these conferences, and desires helpfully to co-operate in the deliberations upon these questions.

Mr. George Harvey, appointed Ambassador to Great Britain, will be instructed on his arrival in England to take part as the representative of the President of the United States in the deliberations of the Supreme Council. The American Ambassador to France will be instructed to resume his place as unofficial observer on the Conference of Ambassadors, and Mr. Roland W. Boyden will be instructed to sit again in an unofficial capacity on the Reparations Commission.

The Government of the United States notes with pleasure your expression of the belief of the representatives of the Allied governments assembled in London that American co-operation in the settlement of the great international questions growing out of the World War will be of material assistance.

KNOX PEACE RESOLUTION PASSED.—On April 30 the Senate by a vote of 49 to 23 adopted the Knox Resolution declaring war with Germany at an end. The resolution as finally revised provided: (1) That the Joint Resolu-

tion of Congress passed April 6, 1917, declaring a state of war with Germany be repealed and said state of war is hereby declared at an end; (2) That all property of the German Government or of German nationals in the possession of the United States be retained until ratification of a treaty with Germany; (3) that the United States reserve all rights, reparations, etc., under the armistice and the Treaty of Versailles.

PRESIDENT HARDING ON FOREIGN POLICY.—The passage of the Knox Resolution was in accord with the President's foreign policy as stated in his message to Congress on April 12. In this message he favored a peace resolution "with essential qualifications." As regarded further measures, he said:

"It would be idle to declare for separate treaties of peace with the Central Powers on the assumption that these alone would be adequate, because the situation is so involved that our peace engagements cannot ignore the Old World relationship and the settlements already effected, nor is it desirable to do so in preserving our own rights and contracting our future relationships.

"The wiser course would seem to be the acceptance of the confirmation of our rights and interests as already provided and to engage under the existing treaty, assuming, of course, that this can be satisfactorily accomplished by such explicit reservations and modifications as will secure our absolute freedom from inadvisable commitments and safeguard all our essential interests."

CONTROL OF OIL RIGHTS

BRITISH WOULD CONFER ON OIL CONTROL.—Washington, April 11.—Adjustment of the dispute between the United States and Great Britain growing out of the San Remo oil agreement concerning Mesopotamia has been suggested informally to the United States, it was learned officially to-day.

The plan proposed was in a memorandum reaching the State Department, but not made in such a manner as to place the necessity for decision upon this government until more definite representations are received.

It is proposed that the United States appoint a commissioner to confer with the British Petroleum Commission, in the belief that such direct negotiations would lead to a more speedy adjustment than might be expected through the usual diplomatic exchanges.

Reports from Constantinople crediting Turkish officials with having declared that British nationals never succeeded in obtaining actual concessions from the Turkish Government for the exploitation of the oil resources of Mesopotamia confirm information that has been in the possession of officials of the State Department for some months.—*N. Y. Times*, 12/4.

PROTEST TO DUTCH ON OIL CONCESSIONS.—Washington, April 29.—Under instruction from Secretary Hughes a vigorous note has been delivered to the Dutch Government by William Phillips, American Minister at The Hague, insisting that American oil corporations must have equal opportunities with the Royal Dutch Company, or any other company, in the development of the celebrated Djambi oil fields in Sumatra and other oil deposits in the Dutch East Indies.

Mr. Hughes takes the ground that the United States has a real interest in the development of the future oil supplies of the world, and has informed the Dutch Government through Minister Phillips that the real interest of the United States Government in these matters lies in the recognition of the principle of "mutual or reciprocal accessibility to vital and natural

resources by the nationals of the United States and by those of foreign countries."

In his note to the Dutch Government, Minister Phillips stated that he was not acting on behalf of any particular American company, but pointed out that certain definite propositions, made in the last year, "furnish sufficient evidence that responsible and experienced American interests are ready and desirous to co-operate with the Netherlands Government in oil developments in the Netherlands Indies."

These interests are the Standard Oil Company of New Jersey, whose officials in New York on Wednesday confirmed recent cable dispatches to *The New York Times* from The Hague to the effect that representatives of American oil interests had submitted to the Dutch Government a bid for half of the oil concessions in the Djambi fields in Sumatra.—*N. Y. Times*, 30/4.

ALLIED REPLIES IN YAP DISPUTE

FRENCH REPLY FAVORABLE.—To Secretary Hughes' note of April 4 to the four Allied Powers protesting against Japanese control of the island of Yap and insisting on the right of the United States to share in all decisions regarding mandates, the French Government made a preliminary reply on April 7 stating that a final answer could be made only upon agreement of the four powers concerned. The note pointed out, however, that, while the award to Japan on May 7, 1919, was not restricted, nevertheless the Japanese representatives had official knowledge of the reservations previously made by the representatives of the United States.

JAPAN UNYIELDING.—Correspondence between Japan and the United States in the Yap controversy was made public on April 18. The fact was revealed that the Japanese note of Feb. 26, 1921, insisted that the decision of May 7, 1919, awarding to Japan all former German islands in the Pacific north of the equator was "final," "with no reservations whatever," and that the Japanese Government "would be unable to consent to any proposition, which, reversing the decision of the Supreme Council, should exclude Yap from the territory committed to their charge."

Secretary Hughes in his note of April 4 produced definite evidence of President Wilson's reservations, but insisted further that no mandate decision of the Supreme Council could be final without the approval of the United States as a participant in the war.

ITALY SUPPORTS AMERICAN VIEW.—In a note on April 29 Italy expressed its belief that the United States in regard to Yap was asking merely for equal privileges with other nations, signified complete agreement with the views expressed in the American note of April 4, and noted that the matter had been referred to the Juridical Commission of the Council of Ambassadors.

LEAGUE ASSEMBLY MEETS IN SEPTEMBER.—Notices were sent in May to members of the League of Nations that the second session of the League Assembly would be held as scheduled at Geneva on September 5. The notices included a tentative schedule of business to come before the session.

CIVIL WAR IN SILESIA

POLISH UPRISING.—Early in May reports were circulated that the Allied Commission on Upper Silesia had decided that, aside from the mining districts of Pless and Rybnik and another narrow strip, the territory should be awarded to Germany. Upon this report, Polish insurgents to the estimated number of 20,000 attempted to secure control of the disputed area. The Allied authorities declared martial law and at various points engaged in armed conflict with Polish bands, but their forces were inadequate to maintain order. France on May 4 requested the Polish Government to take all possible measures to prevent disturbances, and at the same time warned Germany against any invasion of the district by German forces. Poland signified to the Allies its disapproval of the action of the insurgents, and urged that announcement of the settlement be made as soon as possible.

UNITED STATES AND LATIN AMERICA

HARDING ON MONROE DOCTRINE.—At the unveiling of Venezuela's gift of a statue of Simon Bolivar, South America's liberator, in New York City, on April 19, President Harding spoke significantly of the meaning of the Monroe Doctrine, and also suggested his purpose of discussing disarmament with other powers. The following passages may be quoted:

The Monroe Doctrine.—"There have been times when the meaning of Monroeism was misunderstood by some, preverted by others, and made the subject of distorting propaganda by those who saw in it an obstacle to the realization of their own ambitions. . . . . The history of the generations since that doctrine was proclaimed has proved that we never intended it selfishly; that we had no dream of exploitation. On the other side, the history of the last decade certainly must have convinced all the world that we stand willing to fight, if necessary, to protect this continent and these sturdy young democracies from oppression and tyranny."

A Predicted Call to Disarm.—"In the last half century our American commonwealths have not only been able to hold themselves aloof from competitions in armament, but they have built up a system of international arbitration and adjudication which has constantly lessened the danger of armed conflict. There is too little realization, my fellow-citizens of the Americas, of the progress that had been made toward judicial and arbitral settlement of international differences by the American nations. It presents an example well worthy earnest consideration, and affords us an assurance which will justify our purpose to invite the present-day civilization to cast aside the staggering burden of armament."

COLOMBIAN TREATY RATIFIED.—The treaty between the United States and Colombia was ratified by the U. S. Senate on April 20 by a vote of 69 to 19. The treaty provides for the payment of twenty-five million dollars to Colombia in five annual instalments. The Senate rejected the Borah amendment explicitly denying any complicity of the United States in the secession of Panama. According to the terms of the treaty, Colombia has the right in peace and war to use the Panama canal and railroad for purposes of transporting oil, coal, munitions, and troops from her Atlantic to her Pacific coast.

PANAMA MUST ACCEPT AWARD.—On April 21 the Republic of Panama sent a lengthy note to the American Government, in effect refusing the demand of Secretary Hughes that the Loubet and White decisions regarding the Panama-Costa Rica boundary be at once accepted and put into effect. On May 2 Secretary Hughes sent a more forcible note insisting on the just and binding character of the awards and closing as follows:

"It is precisely because of its friendship for the Republic of Panama, as well as because of its desire to assure itself that the peace of Central America is maintained on a stable basis guaranteed by the scrupulous observance of international obligations, that the Government of the United States feels compelled to state that it expects the Government of Panama to take steps promptly to transfer the exercise of jurisdiction from the territory awarded to Costa Rica by the Loubet award, at present occupied by the civil authorities of the Government of Panama, in an orderly manner, to the Government of Costa Rica.

"Unless such steps are taken within a reasonable time the Government of the United States will find itself compelled to proceed in the manner which may be requisite in order that it may assure itself that the exercise of jurisdiction is appropriately transferred and that the boundary line on the Pacific side, as defined in the Loubet award, and on the Atlantic side, as determined by the award of the Chief Justice of the United States, is physically laid down in the manner provided in Articles II and VII of the Porras-Anderson treaty.

SOUTH EASTERN EUROPE

RELIEF FOR AUSTRIA.—On May 8 the plan of the League of Nations Financial Commission for the economic rehabilitation of Austria was made public. The first part of the general scheme provides for the suspension of Allied liens on Austrian Government resources, in order that these may be used as security for an international loan to Austria. The Finance Commission of the League assumes virtually the functions of a receiver or trustee, taking control of these sources of revenue and supervising the purposes for which loans are to be used.

A second part of the plan is the breaking down of the economic barrier between Austria and former parts of the Austro-Hungarian Empire. For this purpose delegates from these states assembled at Porto Rosa near Trieste in early May. The Bank of Austria-Hungary was to be reorganized as a bank of issue for the new Austrian Republic.

Among other proposals of the commission may be noted: an internal loan; stopping of further issues of paper currency; reduction of expenditures; issue of new metallic currency.

HUNGARY DECLARES CHARLES LEGAL SOVEREIGN.—In reply to an inquiry from the Swiss Government, the Hungarian Government in April declared that the former Emperor Charles was Hungary's "lawful sovereign" and that "foreign circumstances" alone prevented him from exercising his rightful powers. Switzerland reserved decision regarding the request that Charles be allowed to take up residence in that country.

CZECHO-FRENCH ENTENTE.—Washington, April 24.—France, in continuation of her policy of creating a Slav barrier about Germany and Russia from among the smaller nations of Europe, has concluded a secret offen-

sive and defensive alliance with Czechslovakia, according to advices received here to-day.

The alliance follows closely upon that concluded by France with Poland. It is reported to be similar also to agreements which France is understood to have attempted recently to negotiate with Jugoslavia, Rumania and Hungary.

By the terms of the alliance concluded by France with Czechslovakia, the two nations are reported to have given pledges to assist each other offensively or defensively in the event of any of the following eventualities:

"Attempted restoration of the monarchical form of government in Germany, Austria or Hungary: appearance of a Bolshevist coup d'état in either Germany or Austria, or any ambitious effort put forward by Austria or Germany in the direction of union of the two countries."

GREEK DIFFICULTIES IN ASIA MINOR. It became known in April that after the March Conference in London Italy, as well as France, negotiated a secret agreement with the Turkish Nationalists. By the terms of the Italian agreement, Italy in return for economic concessions consented to withdraw Italian troops in Asia Minor and support Turkish demands for restitution of territory in both Smyrna and Thrace. The withdrawal of Italian opposition, and of French troops from Cilicia, increased the difficulties of the Greek campaign in Asia Minor; and it was reported that Greece was seeking peace with the Turks on the basis of giving up Greek claims in the Smyrna region while retaining Greek acquisitions in Thrace.

REVIEW OF BOOKS

"A Naval History of the War." By Sir Henry Newbolt. 350 pages (George H. Doran Company). Price $5.00.

In this non-technical history, the author deals only with the operations of the British and German navies in the war. His only references to the participation of other navies in the war are the somewhat erroneous statement that "On May 17th . . . . a flotilla of 20 American destroyers arrived . . . ." and the mention of French battleships at the Dardanelles. While no one will deny to Great Britain the lion's share in the defeat of Germany at sea, other navies did assist and their operations should be mentioned in a book of so general a title. The book goes quite largely into comparative British and German psychology with particular reference to the cause of war and to the development of the submarine campaign.

Admiral Cradock's probable reasons for his decision to fight a superior force in the absence of the *Canopus* are discussed fully, as are also the reasons for the tactics of Jellico and Sheer at Jutland. With the author's conclusions as to the success and effect of the Battle of Jutland, many will not agree entirely.

The various naval engagements between British and German naval forces are dealt with chronologically in a popular way and later the battles of Coronel, the Falklands and Jutland are discussed more fully.

In a chapter on "The Standard of Efficiency" the author cites various submarine attacks by the Germans, all chosen to show the German lack of efficiency and "frightfulness." Those who were engaged in the anti-submarine campaign know of many instances wherein the German submarine captains did "play the game," so that to judge the whole service by these cases, bad as they were, seems not entirely fair.

The most interesting part of the book is that describing the exploits of the British submarine service, particularly in Turkish waters.

B. C. A.

"The Principles of War." By Marshal Foch. Price $7.50. (Published by Henry Holt & Co.)

"*Des Principes de la Guerre*" makes a new appearance in a 1920 edition translated by that versatile military critic, Hilaire Belloc, and published by Henry Holt and Company.

The military student or the dilettante reader with, say, a whimsical taste for strategy, spies the new volume at the book stalls and exclaims, "Here is just what I have been looking for: The Principles of War—and by Marshal Foch! the great generalissimo, published in 1920, and so of

course embodying the product of his remarkable experience in high command during the World War." The literary prospector ingenuously buys.

Let us say that he is of the impetuous unmethodical type—that he curses prefaces or introductions as cumbersome padding and goes directly to Chapter I.

Soon he realizes that he is grazing in the familiar fields of olden times as he recognizes such landmarks as Xenophon, Jomini, Vegetius, Clausewitz, Scharnhorst, Marshal de Saxe, Napoleon—but where are Joffre, Haig, Bing, Hindenburg, Ludendorf, Pershing, the great chieftains of the XXth century!

The book buyer thumbs the leaves backwards until his eye falls upon the opening sentences of the preface: "'Shepherds' fires, lit on a stormy coast, to guide the uncertain seaman': these lines might well be applied to the following pages. They were written for young officers. The reader must not look to find in them a complete, a methodical, still less an academic account of the art of war, but rather a mere discussion of certain fundamental points in the conduct of troops."

"So," says the book buyer to himself, "the book is not, after all, about the cardinal principles of war, but only a manual of troop leading!"

As he searches the preface further he discerns that the subject matter is not the record of conclusions of the experienced field marshal but an exposition of theories entertained by Lieutenant-Colonel Foch.

He is a tight-fisted little fellow, this purchaser. His misinterpretation of the title page will not keep him from squeezing his acquisition for its full value. He reads on "to get his money's worth."

Assuming that readers of the Institute are far more interested in "principles of war" than in troop leading, their attention is invited to Chapter I, wherein there is some excellent military philosophy; that war is not an exact science but an impassioned drama of which the spirit of man is the controlling factor.

Like all the great masters in the art of war, the embryo field marshal, Lieutenant-Colonel Foch, was an ardent advocate of the value of historical precedent and of the necessity for studying military history.

In discussing the value of historical studies, he makes the point that one does not learn the art of war merely by making oneself an encyclopedia of battle precedents. If in the din and fog of battle the commander stops to find in his historical storehouse a set of circumstances similar to the one in which he finds himself, for the sake of discovering what his present course of action should be, his formalism may cost him dear. But accumulated historical precedents, like the study of legal precedents, build up an indoctrinated mind.

"Generally speaking," says the author, "grave situations partially obscure even a bright intellect. It is therefore with a fully equipped mind that one ought to start in order to make war and even to understand war."

This does not undervalue precedent, as precedent. The "fully equipped mind" is such as ought to function rationally. Precedents are means of developing the mind as well as cases for application. The author does not disagree with Napoleon in the latter's reference to the flash of a happy

recollection that comes to the commander in the field. Nor would he deprecate what we have been told about Hannibal's repeated application of tactical devices he had learned in studying Alexander's campaigns. It is by thorough study of history that the military profession acquires the "tricks of the trade" that become second nature. The author summarizes his thought as to the application of history in the paragraph: "In order to do this, we must have a practical teaching including application made to particular cases of fixed principles, drawn from history, in order (1) to prepare for experience, (2) to teach the art of commanding, (3) lastly, to impart the habit of acting correctly without having to reason."

Those who are prone to preach that our strategy should be so and so, because this or that nation does so and so, should read Chapter II, wherein the theme is the national point of view: that the situation must be estimated particularly with reference to the special situation of the several nations from which the doctrine is determined, say, of the offensive or defensive.

The navy may find a thought worthy of pondering in the chapter on "Economy of Forces." If naval tactical doctrine is to bring the greatest possible mass of fire into action at the very beginning, paralleling the enemy's formation, without holding out anything as a reserve to meet the enemy's unexpected maneuver or to take advantage of an enemy opening, it should be remembered that such were also land tactics long, long ago, but that in striving for economy of forces military technique developed the reserve. Will not some naval tactician also discover an economic achievement by a similar tactical development?

Without doubt, the most valuable chapter for the aggregate of all readers is that which discusses *Intellectual Discipline—Freedom of Action as a function of discipline.* This is familiar ground for all War College graduates.

"The art of war," the author quotes Xenophon as saying, "is, in the last resort, the art of keeping one's freedom of action."

It is to keep one's own freedom of action while denying that freedom to the enemy.

"In war, once hostilities have begun, our Will soon meets the independent Will of the adversary."

In order to carry out our plan we must maintain our freedom of action in spite of the enemy.

With the large masses of forces (or large number of ships) to be expected in a major operation, the ability to concentrate is the test. But how can the commander-in-chief be assured of the timely arrival at the right place of his scattered forces unless his intentions are understood and his will obeyed by every unit? The answer is that his subordinates must have:

A mental discipline to understand the result aimed at by the C-in-C;

Intelligent and active discipline (or initiative) in order to maintain the power of acting as desired by the C-in-C; this implies the ability of the subordinate officer to "bring to fruit, with all the means at his disposal, the scheme of the higher command." It is active obedience—highly

intelligent obedience—the intellectual capacity for deciding when to disobey the words of the commander in order to obey his will.

Incidentally, as a foot-note on page 100, Von der Goltz's excellent definition of the much discussed *Initiative* is quoted as "the manifestation of personal will helped by judgment and acting in compliance with the schemes of the high command."

G. C. T.

"The Alpha, Beta, Gamma Navigation Tables." By H. B. Goodwin, M. A., F. R. A. S. (London: J. D. Potter, 1921.)

These tables offer, in a small compact volume, a means of solution of a sight of any heavenly body by time-sight, Saint-Hilaire, or reduction to the meridian, and may also, though with less facility, be used to find azimuth and great circle distance.

The principle of placing natural and log haversines opposite each other, as in Bowditch, has here been extended to the cosines and the method of solution of the time-sight is rendered considerably easier than the usual method.

For solution of sights by Saint-Hilaire this table has little, if any, superiority over the usual method and is distinctly inferior to Aquino's or Ball's tables in that further calculation is necessary to get the azimuth, after the altitude has been found.

D. T. H.

"The Law of Naval Warfare." By J. A. Hall, LL. M., Lieut. Commander R. N. V. A.; of the Inner Temple, London. Lecturer on International Law to Admiral's Secretaries' Course, Portsmouth, England. 2d ed. (London: Chapman & Hall, Ltd., 1921.)

The first edition of this book was published six months before the outbreak of the late war, and was intended to furnish a summary of the rules of international law and British prize procedure, so far as they concerned naval officers in time of war. This second edition published in January, 1921, enlarged and rewritten, has the advantage of the experience and developments of modern warfare which the great war gave and the interesting application of the principles of international law to the great changes at sea resulting therefrom.

The author says in the preface that "from a superficial consideration of the events of the last six years it might appear that, so far as war is concerned, international law has proved to be of no account. In reality the case is quite to the contrary, as the voluminous correspondence between the various belligerent governments and those of the United States and other neutral powers clearly shows. In the war at sea the two main subjects of interest and controversy were the so-called blockade of the central powers by the Allies, and the German submarine warfare." The former, the author claims, was a lawful and reasonable application of the principles of international law to modern conditions; while the latter was manifestly illegal and inhuman, inflicting upon neutrals as well as belligerents wanton loss of life as well as property.

International law as has been said holds good in time of war as well as in times of peace. The change from peace to war changes the gearing, as it were, and the rules of war and neutrality come into play. The sources of the rules of warfare both at sea and on land are as authoritative and well founded as international laws of peace time. They are to be ascertained from treaties which are generally the results of international conferences, having the consent of nations, which consent is the foundation of all international law; they are also derived from the precedents founded on the practice of nations and also from the decisions of learned judges who preside over courts in which prizes are libelled and condemned after a fair trial. Such conferences as those at Geneva for the mitigation of the cruelties of war and for the formation of Red Cross organizations, and the conferences of 1899 and 1907 at The Hague, result in conventions or treaties which are codified rules of warfare. The Declarations of London and of Paris with their rules are of course binding only upon those who have agreed to them, and whose ratifications or accession have made the agreements final. As to the decisions of prize courts, those of Chief Justice Marshall of our Supreme Court and of Lord Stowell of the British prize court stand pre-eminent. Of the decisions of Lord Stowell, Mr. Justice Story, both a learned judge and a learned writer, says: "I have taken care that they shall form the basis of the maritime law of the United States, and I have no hesitation in saying that they ought to do so in that of every civilized country in the world."

Only naval warfare is considered in the book under review and the endeavor is to make it from the point of view of the naval officer. The author, however, though invested with rank as a reserve officer of the British Navy, is normally and primarily a barrister-at-law of the Inner Temple, London. It is not strange as a consequence that a chapter of thirty pages is devoted to the subject of prize courts and prize proceedings, naturally more interesting to a barrister than to a naval officer, especially to officers of a service like our own, who receive neither prize nor bounty money from a prize.

The chapter preceding the one just referred to treats of visit and capture, which naturally is of importance to the naval commander, the boarding officer and the prize master. The rules under this head, though based upon the experience of British naval officers, are in the main those which prevail in the U. S. Navy. In regard to the destruction of neutral prizes the author follows the decision of Lord Stowell in the case of the *Félicité*, that the neutral prize should be released, but, if it should be considered of the gravest importance to the public service of the captors' own state to destroy the neutral prize, then the neutral should have a full restitution in value. In our instructions of 1917 "a vessel *not* engaged in unneutral service must not be destroyed by the capturing officer save in case of the gravest military emergency which would not justify him in releasing the vessel or sending it in for adjudication." The two countries are virtually in agreement in this matter. With the abandonment of the Declaration of London, the British government does not recognize the right of convoy. The United States still follows the Declaration of London in this respect

and claims exemption from search or seizure for the American vessels under the convoy of an American man-of-war. Mr. Hall does not support the contention of the British government in 1915 in the correspondence with the U. S. government that a blockade existed against Germany and its sea coast giving the rights of blockade against neutral trade to Germany. He says that "no blockade of Germany, however, was declared at any time and no case arose to test the legality of this declaration," referring to the declaration contained in the Maritime Rights Order in Council of July, 1916. He goes on to say that "it therefore remains extremely doubtful whether the prize courts would have considered themselves able to apply the order in this respect in the face of previous British decisions and the usual practice of states."

In conclusion I may say that this book is a distinct and valuable contribution to the law of naval warfare, though it must be borne in mind that the author, though endeavoring to be impartial, values above all things British historic precedents and prize courts decisions.

There is a tendency, where naval predominance is both great and essential to the country concerned, to be impatient at any restrictions in naval power, especially by written regulations. Necessities are readily assumed, as they are in a nation having predominant land power. It is always fortunate for the world at large when a war is under way that there is a powerful neutral nation guarding especially and closely the rights of neutrality at sea.

C. H. S.

"The Life of Admiral Mahan." By Charles Carlisle Taylor. Price $6.00. (New York: George H. Doran Co., 1920.)

To set before the Naval Institute an adequate appreciation of this work is no light task, because our service forum of discussion concerns itself purely or chiefly with things naval while Mahan's distinction and world-wide reputation rest—not upon what he did as a naval officer, but—upon what he did as an historian and philosopher of extraordinary breadth of vision with an astounding capacity for analysis. His motto seems to have been *Felix qui potuit rerum cognoscere causas.*

That he was a faithful, painstaking officer is beyond question. In the performance of duty he won recognition of his character and methods, but he gathered no substantial professional laurels. It is no wonder, then, that only some 20 odd pages out of Mr. Taylor's 300 are devoted to Mahan's naval career.

It is my privilege to add an incident or two to this sympathetic and accurate biography. Long before the end of his active service, Mahan said to me, in effect, "The spectacle of a retired officer not knowing what to do with himself and his leisure is distressing. To escape such a condition, I have deliberately made up my mind to busy myself with my pen so that when I, too, go on the retired list, I shall not be idle." Could anything better prove the farseeing wisdom of the man than this remark? Again, I am happy to flatter myself that, in a humble way, I am partly responsible for Mahan's first opportunity and, as is demonstrated by the

portentous results, the chance to show the scope and nature of his genius. When the board, which formulated the plan and aims of the Naval War College, had completed its task, Admiral Luce, its president, turned to his colleagues, Sampson and myself, observing that "We need some one to lecture on naval history and strategy. Where shall we find him?" To this I replied, "Mahan is the very man; why not ask him?" The suggestion was at once adopted; Admiral Luce, as his biographer states, wrote to Mahan, then in command of the *Wachusett* in the South Pacific, inviting him to join the College staff for the purpose in question. This invitation was accepted with an outcome which one might almost say has shaken the world to its foundations. Mahan and the College are inextricably bound together, each to the glory of the other.

It fell to my good fortune to keep the latter alive when, in 1888, Secretary Whitney ordered it away from Coaster's Harbor Island at Newport and placed it under my command at the Torpedo Station. I was well aware that the unacknowledged intent of this move was to kill the College but the latter came into the kindest of hands. Far from neglecting my own child, so to speak, I did my best to preserve its existence, making its sessions while on Goat Island as attractive and valuable as possible, so that, when it was transferred to its fine new building near its original home little, if anything, had been lost of its traditions and methods. Indeed it was said that the Torpedo Station course was most successful and valuable. For this I was indebted to the coöperation of several eminent men—among whom was the late John Codman Ropes, America's greatest military critic.

It would be a waste of time to enumerate Mahan's literary contributions here since it may be assumed that all naval officers who take their profession seriously have read at least, his "Influence of Sea Power upon History," his "Influence of Sea Power upon the French Revolution and Empire"; his classic "Life of Nelson" and his "Sea Power in Relation to the War of 1812." Had he written nothing more than these, his fame would have been assured. Such, however, were his broad view and firm grasp of world politics and policies that his judgment was eagerly sought on topics as remote from his original, nautical philosophy as "Retrospect and Prospect, Studies in International Relations," "Problems of Asia," etc. A full list of his publications is given in Mr. Taylor's volume. A majority of them, if not all, should be in every naval officer's library no matter under which flag he serves. Especially to be recommended is "From Sail to Steam"—an autobiography. Usually when reading Mahan we have to put on our thinking caps for he moves in an intellectual atmosphere far above that in which we lesser mortals have our being but in this particular volume he descends to our level and shows himself to be a delightful *raconteur*, gifted with a charming sense of humor. Read it, by all means, and thus get to know the man as he really was and share in the personal affection of those of us who were honored with his friendship and—in some instances—with his intimacy. One side of his character is best revealed in his "Harvest Within, Thoughts on the Life of a Christian." Mahan was deeply and consistently religious. One may well believe that he never did a thing not approved by his sensitive conscientiousness.

Carried away by devotion to its subject we have strayed widely from the book under review which does full justice to Mahan's literary triumphs and the honors showered upon him by the leading universities of England and America. That he profoundly affected national policies cannot be denied. Indeed, the thought may not be stifled that, through opening Kaiser Wilhelm's eyes to the importance of sea power (vide Chapter XIV, the Margin of Naval Strength) he was directly the cause of that monarch's embarking upon a career of naval expansion which was no slight factor in bringing about the World War. On the other side of the North Sea an appeal to his authority sufficed to secure support for the British Admiralty in initiating and carrying on a building program which preserved to Great Britain an indispensable superiority afloat that eventually spelt defeat to Teutonic arms. It is no idle figure of speech to recognize Mahan's hand both in the outbreak and the conclusion of hostilities. Unfortunately for himself, the Hun was more enthusiastic than thorough as a disciple of the great American philosopher.

Mahan had the courage of his convictions. Read the chapter in this book on the Freedom of the Seas which tells of his opposition at the first Hague Conference to the proposed immunity from capture of belligerent property on the water. He knew, and he was practically alone among the delegates in knowing, that such immunity would have paralyzed any sea power in time of war and would have vastly aided the nation with a great army. Imagine the results of such a policy in the years from 1914 to 1918 and bless Mahan for his timely counsel which later led to Germany's undoing.

And he possessed unusual foresight in refusing to commit himself to the disapproval of the use of asphyxiating gases. Mr. Taylor remarks in this connection:

"The correct interpretation of his intention would seem to be that while he did not advocate their use, he contended that little or nothing was known as to their effects, and his object ostensibly was to preserve for the benefit of the United States any advantages which might accrue to them from the skill of American chemists in the invention and manufacture of this type of destructive force."

In reading his contributions to current periodicals subsequent to, say, 1900 it is impossible not to perceive, concealed between the lines, or even openly stated, the conviction that Germany was about to wage another war of aggression. In 1910 he said that the naval position and maritime power of Great Britain were supreme, "the sole military force in the world superior to anything that Germany can as yet bring into action" and forewarned the nations that concentration of the British fleet in the North Sea, successfully blockading German ports, would decide the issue (p. 209). As if this were not enough to prove the accuracy of his prevision, Mahan made this remarkable prophecy shortly after the war started, that "Germany's future on the sea would end in a sail to English ports to surrender."

Lest we, his colleagues, be charged with a wholly legitimate prepossession in his favor let this pronouncement of one of the ablest of living men be quoted. Lord Sydenham of Combe uses these expressions:

"The secret of Mahan's success was the breadth of view of the writer. One felt, in regarding his calm and often stately periods, that he was regarding history from a pinnacle whence nothing petty was visible, that he addressed his fellow-men of all nations, and that his judgment in matters where bias might have been looked for was serenely impartial. The books bore the impress of statesmanship in the highest meaning of the word."

The volume under review is essentially valuable in presenting the opinions of Mahan's work from an international, not local standpoint. That these agree with those entertained by his own countrymen is highly gratifying. Nowhere else is this world-consensus better summarized than between the covers of this one book which should be attentively studied by the members of a profession that he adorned while with us, who mourn his irreparable loss and who anxiously inquire, where shall his successor be found?

C. F. G.

"Poe, How to Know Him." By C. Alphonso Smith. Price $2.00. (The Bobbs-Merrill Company.)

Although Edgar Allan Poe was not a writer of sea stories, there is that something in his writings that makes appeal to mariners. For one thing, his art in dealing with the mysterious assures his works a place on the cabin shelf. Booklovers of the navy, therefore, will join in extending a welcome to this new volume, "Poe, How to Know Him," by Professor C. Alphonso Smith, Head of the Department of English, United States Naval Academy.

Professor Smith corrects the popular impression that Poe was a dissolute man of morbid genius: he describes the true Poe as a man distinguished for "the diversity of his interests, his future mindedness, his sanity, and his humanity"; he makes us acquainted with a poet and story teller famed throughout the world for "his wealth of sheer intellect and his equal dowry of constructive imagination together with his almost uncanny feeling for form and color, for the fitting melody and the enhancing background."

On the opening chapter Professor Smith explains the plan and method of his book:

"Poe has been studied as an effect, the effect of unfortunate inheritance, of cramping poverty, of uncongenial environment. But let us study him as a cause. A voice is studied backward from its reach and resonance. A projectile force is studied, not merely in its constituents, but by its power to project. 'By their fruits ye shall know them,' not by their roots."

With skill and tact the author has proceeded to accomplish his purpose. "Old world voices are requisitioned to speak for him (Poe), and he in turn, through the wide gamut of his work, is permitted to speak for himself."

The material of the book is conveniently divided into six chapters.

I. *The World Author.*—After a brief summary of the bare facts and dates of Poe's life, his fame abroad is described at length.

"The story is pitiful enough if we end it, as men thought it was ended, on that October afternoon that saw Poe laid beside his grandfather at the corner of Fayette and Greene Streets. But to know Poe we must follow him not to his death but to his coronation in 1909. That year marked his centennial, as it marked the centennial of Lincoln, Holmes, Darwin, Gladstone, Tennyson, Chopin, and Gogol. It was then that historians looked back over the century and attempted a fresh appraisal of the men who had now rounded out their first hundred years. At the University of Virginia, in Baltimore, in New York, in London, in Paris, in Madrid, and in Berlin, Poe's birthyear was celebrated by memorial meetings and centennial articles as the birthyear of no other American poet or prose-writer had ever been celebrated before.

"The story of his conquest of world opinion can be told only in outline. It is a story, however, more dramatic in interest than any that he himself wrote. The American is not to be envied who does not feel a patriotic pride in the career of an author who, if he could not lift himself above the handicaps of habit and ill health and poverty, yet drove through them, and gave to the outside world its first and most lasting conception of Americanism as literature. To know Poe one must know this larger story."

II. *The Man.*—Poe's character, his interests, religious views and philosophy are briefly discussed.

"So far from being unrelated to the problems and interests of his time, Poe seems to me the one man in American literature from whose writings a history of the essential thought-currents of the time could be garnered. But by his writings I do not mean primarily his poems or his stories; in these he deliberately turned away from the things of every-day life or so subtly transfused them as to make the distillation not easily identifiable as concrete incident or personal experience. I mean, above all, the criticisms that he passed on the men and women and things and themes that made up the life round about him."

As evidence of Poe's interest in current political questions and also of his vision, the following is quoted from his comments on the "Report of the Committee on Naval Affairs," of March 21, 1836:

"Our pride as a vigorous commercial empire should stimulate us to become our own pioneers in that vast island-studded ocean, destined, it may be, to become, not only the chief theatre of our traffic, but the arena of our future naval conflicts."

The trend of Poe's speculations on sociology and theology is indicated in several passages. Consilience with the views of John Stuart Mill, contemporary British philosopher and writer, may be noted. The following is quoted from Poe:

"He who, divesting himself of prejudice, shall have the rare courage to think absolutely for himself, cannot fail to arrive, in the end, at the condensation of laws into Law—cannot fail of reaching the conclusion that each law of Nature is dependent at all points upon all other laws, and that all are consequences of one primary exercise of the Divine Volition. Such

is the Principle of the Cosmogony which, with all necessary deference, I here venture to suggest and to maintain."

Concerning Poe's well-known weakness Professor Smith remarks:

"To assert that Poe found poetic inspiration in drink is to fly in the face of all the known facts. Drink did not help him; it hurt him, and he fought it as a foe of art, of thought, of personality, and self-respect. The very nature of his work—with its meticulous care in details, its orderliness, its niceties of analysis, its interplay of reason and logic, its symmetry of construction, makes impossible the conjecture that he could have wrought it or any part of it while excited by drink. Poe drank but he was not a drunkard; he was dissipated but not dissolute."

III. *The Critic.*—This chapter numbers 128 pages, is the longest in the book, and many will find it the most interesting.

"Criticism should come first, for it was through criticism that Poe first made a national reputation; and it is in his criticism that we find the clearest exposition of the literary principles to which, from first to last he was consistently loyal in the production of his own creative work.

"But Poe's criticisms are more than introductions to his own works. They have also a value as historical material in the evolution of American literature. They serve as contemporary witnesses to the supremacy of Cooper, Bryant and Irving, and as heralds of the greater group represented by Longfellow, Lowell, Whittier, Hawthorne, Emerson, and Holmes.

"Poe was primarily neither a dissector of sentences nor a commenter on ideas. He dissects sentences and he comments on ideas but only as these make or mar the structural unity, the wholeness of effect, of the piece that he is criticizing. 'Totality of effect' became Poe's touchstone at the beginning of his critical career; and words, sounds, rhythms, sentences, paragraphs, stanzas, plot, and background are held to a strict stewardship not on their own account but as joint agents in carrying out the predetermined design."

Poe's analysis of "The Raven" is given complete. The nature of this stimulating study is indicated by Poe's introductory sentence:

"It is my design to render it manifest that no one point in its ('The Raven's') composition is referable either to accident or intuition—that the work proceeded, step by step, to its completion with the precision and rigid consequence of a mathematical problem."

IV. *The Poet.* V. *The Writer of Short Stories.* VI. *The Frontiersman.*—These last three chapters are for the most part anthological. They comprise selections of Poe's best work, poetry, short stories and essays, supplemented by explanations of technique; and they conclude a book to be read with pleasure and to be studied with profit.

C. C. G.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-eighth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, $3.50; enlisted men, U. S. Navy, $3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ARTICLE, 1922

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1921 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1921. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1921 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

H. K. HEWITT,
Commander, U. S. N., Secretary and Treasurer.